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## ELECTRICAL EXPORTS.

The figures of electrical exports for May show a slight gain both as to instruments and as to machinery. Whether this marks the turn in a tide that has run the other way for more than a year it is hard to say. We must wait one or two months for later figures before venturing a pronouncement on that point, but are meantime encouraged that the process of gradual diminution should have been checked. Lacking information as to quantities, we might perhaps infer that the lower prices of the past 18 months have had something to do with the total decline in values; but there has evidently been a sharp falling off in gross orders up to this time.

It appears that during May the exports of electrical apparatus and instruments were $539,424 as compared with $464,114 last year. The gains were made in British North America, Brazil, Germany, the Philippines and Mexico chiefly, offset by a further decline of $33,000 in trade with the United Kingdom. In heavy electrical machinery the May shipments were worth $479,951 as compared with $469,088 a year ago. There was a heavy gain in British North America, offset by a corresponding loss in Brazil. Such fluctuations are to be expected, depending upon the receipt of orders that meet all the wants of the moment. It is interesting to note that Japan, whose purchases have lately been very restricted, has increased her imports in this class for the month from $31,277 to $77,209, while Central America jumped from $5,270 to $60,196. The real gains restoring the gross sales to the old totals of 1907 will come when the increases and declines do not cancel out, but all the markets require more from us. In electrical apparatus, the United States has certainly a growing variety of goods to offer, but it takes time and effort to get possible purchasers acquainted with them.

These figures are all in line with those of the general foreign trade of the country, which show the exports to be $200,000,000 less than in 1908, while imports were $100,000,000 less. There is now happily to be noted a marked increase in the importations of raw material, from which it is to be inferred that manufacturing as a whole is getting ready for full resumption of activity.

## THE OHIO CONVENTION.

The Ohio Electric Light Association Convention last week brought out the usual good attendance and practical program which have characterized this association for many years past. The Ohio Association has recovered from the chronic case of overloaded program with which it was suffering two or three years ago in common with the National Electric Light Association and some other organizations. Unlike some of the latter, however, this association took steps to change this condition as soon as it became annoyingly apparent, whereas in the case

of others the reform is yet to be made. The Ohio programs now consist of comparatively few papers on subjects which are likely to draw out considerable discussion, and plenty of scope is given for discussion, which in every case is as long as time permits. Several matters of special note were taken up. One of these was the question of profitable residence lighting. The figures given from Detroit and vicinity as to the amount of such business secured per block in some localities, and the low ratio of maximum station demand to connected load in this class of business, made its possibilities look more attractive than in the past to some managers who have assumed that there is no profit in residence lighting. A town of 700 population, with 189 consumers, as mentioned in the discussion, is certainly something to set one to thinking.

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The matter of supplying all the electric light and power in the various towns of a certain district from a central station in one town has been considerably discussed in the past, but has not been taken hold of as actively as its economic importance demands. It is, in fact, the only salvation for a number of small, unprofitable electric-lighting plants. One interesting feature of the Ohio situation is that several towns are being supplied by companies which are entirely independent of a generating company, and which purchase power from some central station in the district. This suggests the idea that it is not always necessary to wait for the company owning the central station to reach out to the surrounding towns. However, an apparent check to any considerable extension of this plan is that if the central station is not prosperous and progressive enough to reach out for this business itself, it is not likely to have either the apparatus or the inclination to sell power at wholesale at rates low enough to make the proposition feasible for the independent company. Taken altogether, however, to judge from the discussion at this convention as well as from the advice given by prominent central-station operators and financiers at the last National Electric Light convention, there is sure to be a general movement in the direction of consolidation and district supply the next 10 years.

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A report was read on the present status of the development of the titanium carbide series arc lamp for street lighting purposes, with which two of our largest electrical manufacturing companies have been experimenting for several years past. It is a lamp of high economy as regards consumption of electrical energy, but this is partially offset by the present high cost of the titanium carbide negative electrodes. Being an alternating-current lamp suited to operation on 60 cycles, it is being looked forward to with considerable interest because of the fact that when operated from alternating-current supply it requires no rectifying set, as do the luminous street arc lamps employing magnetite negative electrodes. The relations of central-station companies to the public, which was the subject of two papers, brought out a marked tendency among progressive central-station companies to constitute every employee of the company an agent for the explanation of the company's policies. There is no logical reason why all of the work of promoting cordial and friendly relations with the public should be left to a "new business" department consisting of a small fraction of the total number of employees. If all the employees are properly taken into the confidence of the management, and if the policies of the company and the reasons therefor are fully explained, these employees are sure to create for the company a better impression on the public than if they are employed merely as machines to do routine work.

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## Movement of Magnetic Material in a Rotating Field.

There are certain classic experiments with rotatable conductors in a whirling magnetic field which many of our readers know. For example, a copper ball placed in a rotating magnetic field tends to spin about an axis parallel to that of the rotating field. In these experiments, eddy currents are generated in the rotatable conductors, and the magnetic field drags upon these eddies. In fact, the rotating conductors are virtually closed armatures, or act like squirrel-cage secondaries. Professor Boleman describes, in a communication printed elsewhere in this issue, a rather interesting type of motion of iron filings in such a magnetic field. The novelty in the experiment consists in the arrangement of two non-magnetic plates parallel to the plane of magnetic rotation, one above the stator and the other below. By this means iron filings scattered over the plates are acted upon by rotating magnetic forces not in the planes of the plates. The curious fact described is that the filings on the upper plate circulate against the magnetic field, while those on the lower plate circulate with the magnetic field.

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It would seem that this remarkable discrepancy in direction of movement may be explained by hysteresis in the iron particles. If there were no hysteresis, the magnetic pull in one direction, as the field approached, would be the same as the magnetic pull in the opposite direction, as the field receded. In the presence of hysteresis, however, the forces during recession must be greater than those during approach. The iron wheels, therefore, roll over in the direction of the receding magnetic field. Each particle of iron in the iron filings tries to behave like a sphere, and to roll along in the direction of the receding forces, which are applied to the upper sides of the filings on the lower plane, and to the under sides of the filings on the upper plane. As pointed out in the communication, an important outcome from the experiment described is that the behavior of iron filings in a magnetic field cannot be blindly accepted as an indication of magnetic direction of rotation, because, on one of the two planes, the iron filings moved around against the direction of rotation of the field. In fact, it should be stated that, contrary to general belief, iron filings are also quite unreliable guides for determining the intensity of a stationary magnetic field. The magnetic pull upon a spherical particle of iron is zero in a uniform magnetic field, no matter how intense the field may be. In a converging magnetic field, the pull upon the spherical particle is exerted in the direction of convergence, so that what filings show and respond to is the product of field intensity and field convergence. It may be said, then, that when accurate deductions are looked for from the grouping or movement of iron filings, the behavior of grains of iron must be taken with a grain of salt.

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## Color Screens in Color Photometry.

An interesting article by Mr. F. E. Cady, printed elsewhere in the current issue, formulates a scheme for obviating some of the most annoying difficulties of color photometry by means of standardized color screens, acting to reduce the color of the

light under comparison to that of the standard lamp. The project is an old one in principle, dating back to the time of Crova, although its present form is less complete and radical and possibly for this reason easier of adoption. The difficulties of color photometry are obtrusive and notorious. One could write a volume on them without anywhere nearly exhausting the available material. The deeper one goes into the theory of the matter the worse off is he regarding practical remedies, since the phenomena grow more intricate on acquaintance. The methods most in vogue for comparing lights in different colors at the present time are those involving some form of flicker photometer, and those in which the difficulty is attempted to be minimized by the use of working standards of graded color between the extremes to be compared. As regards the flicker photometer in its various forms, great claims have been made for it which, on the whole, have not been substantiated, as Mr. Cady indicates in his paper. The trouble with the flicker photometer is that its advocates have proved too much. When, for example, the statement is gravely made that red and green lights can be compared with the flicker photometer with coincident results, both by persons with normal vision and those who are color blind, it becomes perfectly obvious that something is radically wrong with the instrument, since nothing is more certain than that red and green lights do not have the same apparent luminosity to color-blind persons as to those with normal vision, and the color blind should not under any circumstances be able to obtain the same photometric results as if their vision were normal. With some forms of flicker photometer the color blind and the normal certainly do not obtain the same results, but whether they obtain results which are properly comparable is quite another matter; and finally, as Mr. Cady indicates, it is not yet proved that the substitution of the flicker phenomena for simple comparisons of luminosity leads to the same result. A given observer can obtain constant results at a particular time when comparing lamps of radically different colors by the ordinary photometric methods. Results so obtained, however, do not as a rule check with those of other observers if obtained independently, or with the results of the same observer obtained at another time far enough distant from the first to have a certain amount of independence. A series of graded lights probably reduces the difficulty, but it is by no means clear that the sum of the comparisons made through them is on the whole any more to be trusted than is a direct comparison between the terminal members of the series.

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Crova's method has many possibilities. His regular scheme of comparisons, however, was based on too near an approach to monochromatism, and his screens greatly reduced the brilliancy of the illumination, which is sometimes a serious disadvantage. Crova's fundamental theory, however, that for practical purposes the luminosity of two sources is substantially equal when their luminosities are the same in the middle portion of the spectrum, is essentially correct. The luminosities in the red and blue are practically so small that differences between them which may make very material difference in the apparent color of the light do not materially affect the actual illuminations under consideration. Crova, for the purpose of isolating a narrow portion of the spectrum, went to the use of colored solutions rather than colored glasses, and by so doing he obtained a screen which could be very accurately reproduced, but at the cost of some trouble. The color screens suggested by Mr. Cady, following work which he had done in connection with Dr. Hyde at the Bureau of Standards, are simply blue glass such as is used for spectacles. The capacity of such glass for equalizing the colors of ordinary illuminants is remarkably great. With a proper shade of blue it is possible to get a very fair match even between the light of an open arc and that of a 4-watt-per-candle standard lamp. A lighter shade of the same color would equalize such a standard with a tungsten lamp very readily. It should be noted, however, that these blue glasses, particularly in the deeper tints, do not produce uniform absorption but show bands which might lead to serious errors in the comparison of certain illuminants, particularly those which give their light from discontinuous spectra. It has been possible to obtain colored solutions which are free from this objection.

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The ultimate success of Mr. Cady's plan depends on obtaining standard sets of color screens and using them under quite uniform conditions. It is undoubtedly possible to fulfill the first requirement; the Bureau of Standards, for example, could without much difficulty supply suitably calibrated sets at moderate expense. In using them, however, interesting questions would arise. In the first place, to obtain uniform absorption it is necessary for the screens to be very carefully cleaned prior to use. Insufficient attention to cleanliness of the surfaces can easily produce errors much larger than those the screens are intended to obviate. There is great difference between a glass surface apparently clean and one really clean. The position of the screen with reference to the lights is also a matter which deserves serious consideration. We do not know of any experiments on the relation of absorption in such screens to their absolute distance from the light which they are intended to modify. No such difference may exist in these colored glasses, but such a difference does exist in some similar cases, particularly in the instance of the photographic wedges, which have been considerably and very successfully employed in stellar photometry. It has been definitely demonstrated in this case that the apparent absorption of a given wedge which has no color selectivity is diminished by bringing the screen nearer to the light. Until such idiosycrasies are proved not to exist in these tinted glasses, it would be wiser to employ them near the lights to be compared and at fixed distances from them, rather than on the photometer head. Such position implies that the surfaces of each screen must be quite nearly plane and parallel. The final usefulness of the screen, as Mr. Cady indicates, is dependent on getting an average coefficient of absorption by a large number of experiments with different observers, and upon the limits of error found with different observers in getting such an average. If it is found that a dozen observers reach practically coincident results, then the matter is left in a very satisfactory state. If, on the other hand, the variations from the mean on the part of various observers reach several per cent, the value of the method as an aid to precision is greatly diminished. This is a question of fact which we hope Mr. Cady will soon be able to determine. If his method can be successfully carried out it will be a great relief to those who have to compare illuminants varying as much in color from each other as do many of those now in commercial use.

## Opening of the Jersey City Branch of the Hudson & Manhattan Tunnels.

The twin tunnel tubes of the Hudson & Manhattan Railroad Company, extending from the Hudson Terminal Buildings at Church and Cortlandt Streets, New York, to the Pennsylvania Railroad station in Jersey City, were opened to the public on Monday, July 19. The tunnels are the second pair of tubes under the Hudson River to be put in operation. The connecting land tunnels between the Pennsylvania and Erie stations in Jersey City and the Hoboken station of the Delaware, Lackawanna & Western are scheduled to be opened on Aug. 2, and when this section is put in operation, trains will run through the tunnels completed in 1908 from Twenty-third Street and Sixth Avenue, Manhattan, to Hoboken and Jersey City and thence under the Hudson River again to the downtown terminal at Cortlandt and Church Streets. This will provide uptown and downtown tube connections for three of the five steam railroad passenger stations on the New Jersey side of the river.

The tubes under the river from Jersey City to Manhattan Borough, New York, are a mile long and have been built after the same design as that employed in the new part of the tunnels under the river at Morton Street. They are circular in section, formed by a segmental cast-steel shell bolted together and lined with concrete up to the level of the top of the cable ducts; the top half being unlined. The diameter in the clear is 15 ft. 3 in. The station under the Pennsylvania Railroad terminal is 100 ft. below the level of the concourse of the railroad station and provision is made for carrying passengers up and down from both street and railroad station in hydraulic plunger elevators. After leaving the Jersey City station, the two tubes diverge, the inbound tube runs up under Cortlandt Street, and the outbound tube runs under Fulton Street, two blocks north. Both tubes are connected on the New York side by five-loop tracks in the terminal station.

The terminal occupies three floors below ground in the immense Hudson Terminal Buildings. There are four main entrances and exits from the station concourse. The exits are broad curved inclines leading to the streets. The station platforms are 370 ft. long and permit the operation of eight-car trains. The platform level is lighted with five-lamp ceiling clusters inclosed in ground glass-bowls. The edges of the platform are also illuminated with rows of incandescent lamps. Most of the ceiling clusters are connected to 240-volt, three-wire, direct-current lighting mains, which also supply the offices on the upper floors of the buildings. At frequent intervals, however, a cluster of five incandescent lamps, forming part of the ceiling illumination, is connected to the third-rail circuit. This insures against total darkness in the station in case the lighting circuits to which most of the ceiling fixtures are connected should fail. The lamps on the edges of the platform are also connected to the railway circuits. No automatic switches have been installed to cut in outside sources of energy in case the local supply should fail; but the switchboard in the substation of the building is connected through a hand-operated switch with the mains of the New York Edison Company. A large storage battery which floats on the building lighting circuits affords a supply of electricity for short periods without any interruption to the lighting circuits should the rotaries in the substation or the generators in the power house on the Jersey shore momentarily fail.

After Aug. 2, trains will be run on three routes, and to avoid confusion on the platforms, illuminated train-announcer signs have been installed. There are six on each platform. The sign consists of a narrow box supported from the ceiling near the edge of the platform. Both sides of the box are formed of three panels of ground glass behind which are sheet brass stencils showing the three routes for trains. Mounted between each pair of panels are six incandescent lamps connected in groups of three. The panels are surmounted by a sign with two arrows pointing toward the track and reading: "Train For." The lamp circuits are controlled either from the signal cabin on the baggage platform or from the dispatcher's office. As a train enters the station a switch is closed illuminating the proper route panel in all three signs on the side of the loading platform from which the train departs.

In the basement of the terminal building in New York, below the train platform level, a large substation has been constructed where the high-tension, alternating current is converted into 625-volt current for the railway circuits and to 240 volts for the lighting circuits in the buildings. The substation contains at present two 1500-kw General Electric rotary converters for railway load and four 750-kw rotaries for lighting load. Foundations are provided for two additional 1500-kw units, giving the substation an ultimate output of 9000 kw. Each of the railway units has a separate set of three 750-kw, air-cooled transformers taking 25,000 25-cycle current and delivering 390-volt current at the secondaries. The rotaries deliver 625-volt, direct current to the third-rail feeders. Each of the four lighting units is supplied from three air-cooled transformers. The substation is lighted by Cooper Hewitt mercury-vapor lamps suspended from the ceiling. Cooling air for the transformers is supplied by motor-driven fans taking air from an intake running from the roof.

## Proposed Connecticut Public Utilities Commission.

At the last session of the Connecticut Legislature, following the defeat of a measure to authorize a Public Utilities Commission, a special committee was appointed to draft a bill on the subject, and this body has just made public the result of its deliberations. The bill as reported deals with telephone, electric-light and water companies, electric-railway companies not being included for the reason that they are now subject to the jurisdiction of the State Railroad Commission. Three commissioners are provided for, to be appointed for terms of six years by the Governor by and with the advice and consent of the State Senate, each to receive a salary of $3,000 per year. The commissioners are to have power to employ accountants, experts and engineers and to send for persons and papers. All corporations under the jurisdiction of the commission are required to make a sworn report annually on a blank form prepared by the commission. The bill contains provisions designed to do away with stock watering and the issuing of bonds for more than a property is worth. Any customer who shall not receive proper or adequate service may make a complaint in writing to the commissioners; and any person who considers that a corporation does not perform any of the duties imposed upon it under the act may make a similar complaint. Upon investigation the commissioners shall recommend in writing to the corporation the taking of such action as will properly remedy what they find to be justly complained of; and if the corporation does not act upon such recommendations within a reasonable time, the commission may, through the Attorney-General, bring such action in the courts as may be necessary to enforce compliance by the corporation.

## Central-Station District Heating Association.

Immediately following the adjournment of the Ohio Electric Association convention at Boody House, Toledo, Ohio, July 15, 1909, a number of gentlemen who are conducting a district steam or hot-water heating business in connection with their electric-light and power plants, met and formed a preliminary organization for the National District Heating Association. It is intended to take in as active members companies and individuals operating district heating systems and as associate members those manufacturing and installing such systems and accessory appliances. The officers are as follows: President, Mr. A. C. Rogers, 752 Euclid Avenue, Toledo, Ohio; vice-president, Mr. A. N. Cope, Springfield Light, Heat & Power Company, Springfield, Ohio; secretary and treasurer, Mr. W. A. Wolls, Columbus Railway & Light Company, Columbus, Ohio. Chairmen of

committees were appointed as follows: Program committee, Mr. D. J. Hard, of Cleveland, Ohio; finance committee, Mr. A. N. Cope, of Springfield, Ohio; executive committee, Mr. E. F. Gwynn, of Delaware Light, Heat & Power Company, Delaware, Ohio. It is planned to have the first convention at Columbus, Ohio, the latter part of November. Members' annual dues have been fixed at $5 and those of associate members at $10.

## Steam Power Electrical Transmission from Galena, Ill.

The Power Construction Company is building a plant at Galena, Ill., to transmit power 25 miles north into Wisconsin, of which mention was recently made in these columns. The construction company will turn the plant over to the Interstate Light & Power Company, of Wisconsin, and the Interstate Light & Power Company, of Illinois, for operation. Unlike most transmission plants, the power is supplied by steam-driven units. The initial installation will consist of two Allis-Chalmers reciprocating Corliss engines driving General Electric 2300-volt, 60-cycle, three-phase, alternating-current generators. One of these units will be of 1500-kw rating and the other of 1250 kw. The machine voltage will be raised by means of oil-insulated, self-cooled transformers to a line potential of 33,000 volts. The transmission line will be 25 miles long, and there will be substations at Hazel Green, Benton and Cuba City, with a terminal station at Plattville, Wis. The local distribution will be at 2300 volts, further reduced to 440 volts where necessary. Alternating-current distribution as well as transmission will be used, according to the present plants. Messrs. H. M. Byllesby & Company, of Chicago, are the engineers.

## Chicago Electric Club at Michigan City.

The first annual outing of the Electric Club of Chicago at Michigan City, Ind., on July 17, proved a great success. About 115 members and ladies made up the party, which left Chicago on the steamer *Theodore Roosevelt* at 10 a. m. On the way across Lake Michigan several wireless messages were sent, and Mr. C. A. S. Howlett, president of the club, dispatched a message to his home in Chicago while in mid-lake, and received an answer on board 40 minutes later. The afternoon was spent in the beach park at Michigan City, dinner and supper being served on the large veranda of one of the buildings by the ladies of a local church. Mr. John J. Schayer, the chairman of the entertainment committee, made an arrangement by which the visitors received meals superior to the usual summer-resort class, while the ladies netted a considerable sum to apply on the church debt. The weather was delightful, and with a baseball game on the beach, various athletic contests, fine bathing and a homeward sail by starlight, the day's pleasuring was thoroughly enjoyed by all who took part in it.

## Cosmopolitan Electric Company, Chicago.

Operating under a 50-year franchise granted in 1895 the Cosmopolitan Electric Company, of Chicago, has been doing quietly and on a small scale a central-station business in Chicago for the last 10 years. It is now making preparations to increase its facilities for furnishing electric service to a considerable extent. The company is erecting a power generating station at the corner of Canal and Grove streets, on the site of its present plant, which is of a rather temporary nature. Two 3500-kw, 12,000-volt generating units will be placed in this station, and the plant will be ready to supply electricity in about three months. Space is left for two other units of equal size. These units consist of Curtis horizontal steam turbines and General Electric alternators. The steam-raising equipment consists of Babcock & Wilcox water-tube boilers, and draft is obtained by means of a steel stack. The principal office of the company is at 115 Dearborn Street, at which address the Ogden Gas Company maintains its offices. When the new building of the People's Gas Light & Coke Company, at Michigan Avenue and Adams Street, is completed it is probable that the Cosmopolitan Electric Company will remove its administrative offices to that building.

The rates offered by the Cosmopolitan company are about the same as those of the Commonwealth Edison Company, possibly a little lower in some schedules. Compared with the rates of the Sanitary District the prices are probably higher than those of that municipal body, which supplies electricity generated at the hydro-electric plant on the Drainage Canal at Lockport, Ill. The Cosmopolitan company has already a number of underground and overhead lines for transmitting its electrical energy from the power plant. It is believed that, although a general central-station service will be given, particular attention will be paid to supplying electricity for power users. Mr. Roger C. Sullivan is the secretary of the Cosmopolitan Electric Company, and has been a prominent figure in the management of its affairs. Mr. H. E. Niesz, until July 15 assistant to the second vice-president of the Commonwealth Edison Company, is now manager of the Cosmopolitan company and he will devote his entire time to his new duties. Mr. C. G. Y. King is constructing engineer, Mr. James Furlong, superintendent; Mr. J. H. Delaney, contracting agent, and Mr. H. E. Wulfing, electrical engineer. It is rumored that the Cosmopolitan company is affiliated with the Commonwealth Edison Company.

## Some Boston Electrical Statistics.

The recently published report of Commissioner of Wires James E. Cole to Mayor Hibbard, of Boston, for the fiscal year ending Jan. 31 last throws considerable light upon electrical developments in that city during the past few years. During the past year about 2 miles of streets, carrying 46 miles of overhead wire, were cleared of this construction and added to the underground system. In many cases tungsten lamps have taken the place of the old naphtha street lamps used in Boston on minor thoroughfares. The principal traction, lighting and signaling companies have all extended their underground service during the year. The cables now used vary in size from two-conductor messenger and fire-alarm lines to 200-conductor telegraph and 600-pair telephone cables, and from No. 8 lighting cable to 2,000,000 circ. mil rubber-covered feeders for railway service. There are now about 1,572,100 ft. of conduit installed in Boston, with 9,885,000 ft. of single duct, 12,800,000 ft. of cable, 7143 manholes, 15,862 services, 620 Edison distribution boxes and about 600,000 ft. of Edison three-wire tube. The largest amount of underground work done during the year was by the Boston Edison Company, which installed 17,936 ft. of conduit, carrying 223,776 ft. of cable. The Boston Elevated Railway Company installed 14,977 ft. of conduit, or 73,862 ft. of cable, and the New England Telephone & Telegraph Company, 2860 conduit-feet with 77,409 ft. of cable. All the companies using underground service installed 747 new services in the year, a gain of 43 compared with the previous year. In the past 15 years over 57,000,000 ft. of overhead wire have been removed from the streets of Boston, less than one-fifth of this work having been done by the Wire Department. The total number of poles removed in this period was 2350.

One of the most interesting features of the report is its comparison of the electrical distribution of power in Boston for several years, tabulated in detail for the different companies and totalized isolated plants. Since Jan. 31, 1906, the total boiler capacity in the electrical installations in the city has increased from 115,854 hp to 146,762 hp, and the rated horsepower of engines from 142,931 to 236,400. The number of motors has increased, including the Boston Elevated, from 13,724 to 18,351, and the motor capacity from 192,493 hp to 326,652 hp. The increase in motor horse-power on the Boston Elevated system was from 153,860 hp in 1906 to 271,204 hp in 1909, and on the Edison system the motor capacity increased from 28,030 hp in 1906 to 38,625 hp in 1909. These figures

reflect a most healthy demand for increased electric service on the part of the Boston public, the percentage increase in the traction field being about 80 and in the central station about 35 per cent, as expressed in motor horse-power. The actual traffic of the railway company has, of course, not increased in anything like these proportions, but the enlargement of motor capacity still indicates a growth in the scale upon which service must be rendered, and, as such, is a sign of electrical expansion. About seven times the motor horse-power is now in service in Boston that was installed 11 years ago.

In the generating plant field there are 319 isolated plants now compared with 276 in 1906, an increase of only 15 per cent in this period. The Boston Elevated Railway Company has increased its number of power stations from 8 to 10, and the total number of power stations listed is 348 compared with 303 in 1906. The largest generating unit in New England is a 12,000-kw turbo-alternator in the L Street station of the Boston Edison Company, and two more of these machines are now under contract. In addition to the above, the Edison Company has increased the capacity of two of its substations by the installation in each of 2000-kw motor-generators, and there have been installed four 1000-kw motor-generators at the Atlantic Avenue station to be used for emergency service to reinforce the L Street station in case of accident; and at present a new substation is being built in the North End to be used to distribute direct current to the underground network in the vicinity, as well as a center of distribution for alternating-current service in Charlestown.

During the year many important changes have been made by the Boston Elevated Railway Company at its power stations. At Lincoln power station an extensive addition was made, and two 2700-kw units added; a 2700-kw unit was added to Harvard and Charlestown stations, each, and important betterments in the switchboard equipment and station flooring in the line of fireproof construction have been effected. In the interior lighting field, about 60,000 tungsten lamps were installed during the year. The report states that "only a very small proportion of the fires attributed to electric wires by the daily press are found upon investigation to be due to that cause. This is not remarkable, however, as there usually is no opportunity before the matter is printed for either the papers' representatives or the proper authorities to make a correct investigation as to the cause of the fire; and provided the case is not plainly evident, it seems to be the custom to report the cause as electrical for want of better information." Of the 15 accidents to persons that came to the attention of the department but one was fatal, and in this case the death of the victim was due to his climbing upon an iron bridge and making a wilful contact with an overhead lighting circuit. Of the 23 fires found to be electrical in origin, 11 entailed no insurance loss, being very slight. The remainder caused a total insurance loss of about $19,300. The principal causes of the electrical fires were the deterioration of insulation in an oil warehouse, leaky roof, crosses, grounds and short circuits, defective rheostats, lamp in contact with inflammable substances, and hot metal from blown fuse falling upon dry goods. One of the most interesting causes of fires was in a store where the end of a wire which had been cut off and left bare of insulation came in contact with a metal rod lying on the floor. The further end of the rod was in contact with the support of a cash-carrier system, carried by wires run to screw eyes in the ceiling. Current melted off one of these wires and the metal ignited the dry goods below.

## Mammoth Electric Organ for Atlanta.

One of the largest electric organs ever built in the United States will shortly be constructed for the Atlanta, Ga., Auditorium Armory by the Austin Organ Company, of Hartford, Conn. The building is capable of seating 8000 persons aside from the main floor or arena. The organ will be placed in a large chamber at one end of the auditorium, with an echo organ at the opposite end in a smaller auditorium, an opening being provided through the wall between the two halls. The main organ will be controlled from a four-manual movable console placed about 65 ft. in front of the instrument. The echo organ will be provided with an independent console, so that it can be used alone in the smaller auditorium when desired. The entire action will be electric, a current of 8 volts being supplied for the service by a specially wound generator. The organ will be blown by a 20-hp motor direct-connected to a series of fans, raising the wind pressure by steps. A universal air chest, supplying the pressure uniformly to all pipes regardless of the demand, is a special feature of this organ, which is now common to this particular company's work. The wind pressures to be used on the organ are 10 in., 15 in., and 50 in. water column. A separate motor and blower will be provided for the echo organ in the small auditorium, which will be voiced on a 5-in. wind pressure. A separate motor and blower will also probably be used for supplying air to the 50-in. wind service, which is the highest pressure ever used in connection with organ pipes. This 50-in. wind is to supply the "tuba magna," a reed producing a smooth tuba tone of large power. The supply of air is automatically controlled by the reservoirs of the instrument.

This organ will consist of a pedal organ, with 576 notes, with pipes from 8 ft. to 64 ft. in combination length; a great organ of 854 pipes, 2 ft. to 16 ft.; a swell organ, having 1181 pipes, from 2 ft. to 16 ft.; orchestral organ, 791 pipes, 2 ft. to 16 ft.; solo organ, 657 pipes and 20 cathedral chimes; and the echo organ, with 499 pipes, 4 ft. to 16 ft. All contacts are of gold and platinum.

## Ohio Electric Light Convention.

The Ohio Electric Light Association held its fifteenth annual convention July 13, 14 and 15 at Toledo, Ohio, the meetings and headquarters being at the Boody House. The attendance of central-station men was larger than at any previous convention. After the adjournment of the final session at noon July 15, the convention went by special train over the Lake Shore Railroad to Sandusky, Ohio, and thence to Cedar Point for a banquet and other entertainments.

The first session of the convention opened at 10:15 Tuesday morning. Secretary D. L. Gaskill announced that President C. R. McKay, formerly of the Toledo Railways & Light Company, who has recently gone to Covington, Ky., to take the management of the Union Light, Heat & Power Company, was unable to be present and preside at the meetings. As Mr. J. C. Rothery, of East Liverpool, the vice-president, was unable to be present at the convention until the last session, most of the sessions was presided over by Past-President W. P. Engle, whose efforts two years ago at drawing out good discussions were well remembered by members.

Mr. Albion E. Lang, president of the Toledo Railways & Light Company, and Hon. Brand Whitlock, Mayor of Toledo, gave addresses of welcome. Mr. Lang commented on the number of associations of various kinds in the electrical field, but said that the State association is probably of the greatest practical benefit. Mayor Whitlock called the American city the seventh wonder of the world. There is a constantly increasing tendency for population to crowd together in cities, and electricity will doubtless play an even more important part in the city life of the future than in the past.

Mr. F. M. Tait, chairman of the executive committee, reported 15 applications for membership, which were duly elected. Four more applicants were presented at the closing session and elected. D. L. Gaskill, secretary and treasurer, made his report, showing a balance from 1908 of $237.92 and total receipts, including the balance from last year, of $2,079.50. Expenditures were $1,589.01, leaving a balance July 6 of $490.49. The souvenir program this year was published by the association itself instead of being let out as a concession, as was the case last year. The association was very successful in running

the program itself, the receipts being $2,255 from advertising, giving a profit to the association after paying the expenses of printing and distributing of $1,655. The secretary's report closed with an expression of appreciation of the work done by President C. R. McKay in preparing for this convention before he left the State, and also of the work of Mr. F. M. Tait as chairman of the executive committee. After some announcements as to entertainment features provided for the ladies, the papers were taken up.

Mr. F. T. Mather, of the Edison Illuminating Company, of Detroit, Mich., presented by special invitation a paper on "Residence Lighting," which gave some very interesting figures on residence business in Detroit. This paper was prepared from material presented in a paper to the Association of Edison Illuminating Companies last year, an abstract of which appeared in these columns in the issue of Nov. 7, 1908. This and the discussion which followed brought out the fact that the possibilities as to percentage of houses connected and profits in residence lighting have been frequently underestimated. Some figures were given showing a remarkably high percentage of residences connected in some towns. Discussion of this profitable subject took up the remainder of the morning session.

On Tuesday afternoon Mr. H. E. Hutchings, of the Dayton Lighting Company, and Mr. Claude Smith, of the Bradford & Gettysburg Electric Light & Power Company, each read papers on "The Supply of Electric Current to Other Towns from a Centrally Located Station." This also brought out one of the important discussions of the convention. Mr. Smith is the manager of several companies which do not own central stations, but purchase power to supply small towns from neighboring central stations. All of those discussing the subject favored centralization of power plants in this way, and it would appear that this movement toward centralization, which so far has been most pronounced in Illinois and a few thickly-settled Eastern communities, is destined to spread rapidly through Ohio. Abstracts of these papers and discussions will be given in later issues. The question box was taken up for a short time at the close of this discussion.

After this session special cars were ready to take the convention to the Toledo Casino, north of the city on the Maumee River. After a dinner at the Casino at 6:30 the party enjoyed the river scenery and cool breezes until 8 o'clock, when it attended the Casino Theater in a body.

On Wednesday morning Mr. E. E. F. Creighton, of the General Electric Company, gave a talk with some demonstrations on the subject of the best method of protection from lightning. In these demonstrations he used an induction coil with spark-gap to show the effect of choke coils and other devices in connection with high-frequency lightning discharges. His demonstrations were impressive as to the amount of choking effect offered to high-frequency discharges by even a single turn or loop of wire. The general conclusions of his remarks were that lightning arresters are good for the protection of apparatus, but that it is not commercially practicable to use them for the protection of lines. The multi-gap arrester is the best for distributing circuits, and the aluminum cell arrester the best for high-tension transmission lines.

Mr. C. C. Custer, of Piqua, Ohio, then presented a paper on "Commercial Organization of Electric Lighting Companies and Their Relation to the Public." Another paper on the same subject was read by Mr. W. E. Richards, of the Toledo Railways & Light Company. Mr. N. B. Ayres, of the Dayton Lighting Company, presented a paper on "Boiler-Room Economy" in which he forcibly called attention to the need of devoting thought to the operating and producing end of the business as well as to the selling end, which is now receiving so much attention. This was followed by discussions both of public relations and boiler-room economies.

Mr. F. M. Tait, chairman of the executive committee, reported the appointment of a nominating committee by the executive committee as follows: Messrs. W. J. Hanley, of Cleveland; E. A. Bechstein, of Sandusky, and S. M. Rust, of Greenville. As it was learned that the secretary had expended $150 for miscellaneous items not charged in connection with getting out the souvenir program, which program had netted the association over $1,600, it was voted to appropriate $150 to reimburse the secretary for this expense. The secretary's salary for 1910 was then raised from $600 to $750.

Wednesday afternoon the session was opened with the reading of a paper written by Mr. J. C. Rothery, of East Liverpool, Ohio, on "Plans to be Followed in Supplying Lamps to Consumers." After some discussion on this subject, Mr. S. M. Rust, of Greenville, read a paper on "Factors which Should Be Considered in Making Contracts for Street Lighting." This also drew out considerable discussion, which showed that some companies are not getting anywhere near the prices they should obtain for street lighting. The number of series tungstens in use for street lighting is now very large.

After this session the convention went to Toledo Beach for surf bathing and a frog-leg dinner, followed by dancing in the evening and other impromptu entertainment furnished by various members of the party.

The Thursday morning session opened with Vice-President J. C. Rothery in the chair. The first order of business was the presentation of the report of the nominating committee, in accordance with which report the following officers were elected: President, Mr. J. C. Rothery, East Liverpool; first vice-president, Mr. E. H. Beil, of Youngstown; secretary and treasurer, Mr. D. L. Gaskill, of Greenville. Executive committee: Messrs. F. M. Tait, Dayton; E. A. Bechstein, Sandusky; W. P. Engle, Defiance; Sheldon Rogers, Columbus; W. F. Hubbell, Wauseon. Advisory committee: Messrs Samuel Scovil, Cleveland; F. M. Tait, Dayton; D. L. Gaskill, Greenville. Finance committee: Messrs. J. T. Kermode, Cleveland; T. D. Buckwell, Toledo; W. C. Anderson, Canton. Publicity committee: Messrs. T. H. Jungk, Fremont; E. L. Booth, Bellaire; J. C. Martin, Wilmington. Membership committee: Messrs. W. J. Hanley, Cleveland; E. L. Van Winkle, Cincinnati; P. J. Williams; F. F. Rossman, Cleveland; I. M. Cassell, Cleveland; H. B. Rogers, Columbus; F. C. Caldwell, Cincinnati.

PRESIDENT-ELECT J. C. ROTHERY.

The president-elect, Mr. J. C. Rothery, is general manager of the East Liverpool Traction & Light Company, the Steubenville & East Liverpool Railway & Light Company and the Ohio River Passenger Railway. Mr. Rothery was born 52 years ago in Scotland, where he received an academic education. In his younger days he went to sea and worked up to be master of a vessel. From this he went into the engineering department of the Michigan Central Railroad. He was connected with the erection of the cantilever bridge at Niagara Falls and for a number of years was superintendent of this bridge after its completion. He resigned from this to build and manage the

Niagara Falls Park & River Railway, which follows the Canadian side of the Niagara River from the Falls to the end of the Gorge. He was superintendent of this road until it was absorbed by the International Railway Company, of Buffalo, after which he continued as superintendent of all the lines of that company centering at Niagara Falls, including the Niagara Falls and Buffalo line. In 1906 he went to East Liverpool, Ohio, to assist in rebuilding the East Liverpool Traction & Light Company's system connecting Steubenville and Beaver with Liverpool. He has been a member of the Ohio Electric Light Association ever since he came to the State in 1906 and was vice-president of the association the past year. Following the election of officers an amendment to the constitution was taken up which was presented last year by Mr. M. E. Turner, of Cleveland. This provides that instead of a nominating committee appointed entirely by the executive committee as at present, the nominating committee shall consist of five members, two appointed by the executive committee, two elected by ballot in open meeting of the convention and one appointed by the president. This amendment having been considered for a year by the executive committee, was reported out for discussion. The object of the amendment was explained to be that of making elections a little more democratic and preventing the possibility of control by a clique. Some thought that if this were the object it did not go far enough, because under the proposed amendment three out of the five members of the nominating committee would still be appointed by existing officers. Mr. Turner, who framed the amendment, said that he intentionally made it so that the appointment would not be too democratic in order to avoid the danger that men not familiar with the association's possible work be appointed on the committee. This amendment was finally referred to a committee of three to be redrafted and reported to the association next convention before election. This committee as appointed consists of Messrs. F. M. Tait, of Dayton; M. E. Turner, of Cleveland, and C. V. Hard, of Worcester, Ohio. Resolutions of thanks were passed expressing the appreciation of the association for the work done by the Toledo Railways & Light Company and the supply houses of Toledo in providing for the comfort and entertainment of the convention.

A paper written by President C. R. McKay on the "Titanium Arc Lamp" was then read by Mr. Richards, which was briefly discussed. This was followed by reports on "Tungsten Lamp Experiences" from various companies. Such reports were briefly made by Mr. Booth and Mr. W. E. Richards, of the Toledo Railways & Light Company; Mr. E. H. Beil, of Youngstown; Mr. W. C. Anderson, of Canton; Mr. M. E. Turner, of Cleveland; Mr. A. A. Pointer, of Antwerp; Mr. J. C. Rothery, of East Liverpool, and Mr. Henry Schroeder, of the General Electric Company. Mr. Geo. C. Osborne, of the General Electric Company, read some letters from companies in other States regarding tungsten-lamp work, and Mr. F. M. Tait told of a trial installation of ornamental posts carrying five 100-watt tungsten lamps placed on one of the Dayton downtown streets. The convention then passed resolutions of thanks to Mr. W. P. Engle for his efficient efforts in presiding over the first four sessions.

Abstracts of the papers and discussions will appear in later issues.

## Union College Department of Electrical Engineering.

In 1845 the School of Engineering was founded at Union College, Schenectady, N. Y. In 1895 a course in electrical engineering was introduced, which in 1902 was reorganized and made a separate department under the direction of Dr. Chas. P. Steinmetz. A four years' course of study is required for the degree of bachelor of engineering and a one-year resident graduate course leads to the degree of master of electrical engineering.

The four-year course of study offered aims at a thorough and broad scientific education of the prospective engineer, rather than the specific training of the specialist. The instruction consists, therefore, of three classes of studies, the general culture studies furnishing such training as is now considered essential for every educated man, as languages, literature, history, etc. Such instruction extends over a large part of the first two years, and is then followed by a broad and general technical education, giving the student the fundamental principles and their application to all branches of engineering. Then follows specific instruction in electrical engineering, which, while enabling the student, after graduation, to enter the field of electrical engineering practice in the manufacturing or operating company or consulting engineer's office in a subordinate capacity only, has given him all the necessary requirements to gather in a few years' practice the knowledge required for independent work of greater magnitude.

Through the active interest which the General Electric Company takes in technical education, an arrangement has been effected whereby the students in the junior and senior are admitted to the company's works at appointed times, under the direction of their instructor, with the privilege and opportunity of studying and inspecting the plant and operations.

To those students who wish to add to their college training after graduating from the four courses, a graduate course is offered of one-year resident study. Besides instruction in higher branches of electrical engineering, there will be occasion to carry out original investigation under the supervision and with the assistance of specialists prominent in electrical engineering practice on subjects closely connected with the most recent advance of electrical engineering. This course leads to the degree of master of electrical engineering, and is open to graduates of Union College and of other institutions approved by the faculty.

The electrical engineering laboratory, opened for classes in the fall of 1906, is thoroughly up to date, both in construction and equipment. The ground plan of the building is T-shaped, the upper bar of the T having two stories. The lower floor is devoted to three laboratory rooms, the largest of which is 101 ft. x 35 ft. This is the main laboratory and extends from front to rear of the building. The two other rooms, one on each side of the main laboratory in the upper bar of the T, are devoted to thesis work, instruments, the more delicate pieces of apparatus and other special uses. A well-lighted drafting-room occupies the major part of the second floor, being 73 ft. x 27 ft. in dimensions.

In equipping the laboratory special consideration was given to the selection only of such representative types of apparatus as can be handled, operated and tested by the students, and of a size sufficiently large to correspond to modern practice, but not so large as to make the operation under abnormal conditions—that is, under conditions which, as a rule, are specially instructive—unsafe for the apparatus. All such machinery as the student cannot be permitted to handle freely was excluded from the equipment. Power is supplied from a direct-connected unit consisting of a Westinghouse gas engine and a direct-current generator; a motor-generator set consisting of a 17.5-kw, direct-current generator direct-connected to a three-phase, 220-volt induction motor; connection with the 550-volt direct-current trolley circuit of the Schenectady Railway Company, and connection with the three-phase, 2300-volt power circuit of the Schenectady Illuminating Company. In the latter case voltage is reduced by banks of step-down transformers, so that the students can handle the safe, low-tension circuits only. A secondary supply is also secured by means of a group of plate storage batteries charged by a mercury-arc rectifier upon the alternating-current power circuit.

Among the recent additions to the laboratory are an oscillograph and a potentiometer. With the former wave-forms may be traced or photographically recorded and transient phenomena of the electric circuit studied and investigated. The potentiometer is an absolute standard for the calibration of electrical instruments and is similar to that used by the Public Service Commission of New York State.

## New York Public Service Commission News.

The Public Service Commission, Second District, has authorized the Hornell Gas Light Company to mortgage its property and franchises to the amount of $250,000 to secure an issue of bonds maturing in 40 years and bearing interest at a rate not less than 5 per cent. It is authorized to set aside and reserve $95,000 in bonds to refund bonds now outsanding. Seventeen thousand dollars of the bonds are authorized to be sold at not less than 90, the proceeds of which are to be used in the discharge of bills payable, for making improvements to the plant and system and the acquisition of property.

The Penn Yan Gas Light Company has been authorized to execute a mortgage to secure an issue of $100,000 5 per cent 40-year bonds. Of this amount $45,000 is to be used in refunding outstanding bonds and $10,000 in bonds to be sold at not less than 90 and the proceeds used to discharge bills payable and to make certain improvements to its plant and distributing system.

The Newark Gas Light & Fuel Company has been empowered to execute a mortgage securing an issue of $100,000 in 40-year 5 per cent bonds of which $30,000 is to be used to retire outstanding bonds and $30,000 in bonds to be sold at not less than 90 to be used for the discharge of bills payable and for improvement to its plant and distributing system.

The commission has authorized the Norwich Gas Light Company to execute a mortgage securing an issue of $250,000 40-year 5 per cent bonds, $85,000 in bonds to be used to retire outstanding bonds and $85,000 in bonds to be sold at not less than 90 and the proceeds used for the discharge of bills payable and improvement of its plant and distributing system. The above companies are controlled by the Associated Gas & Electric Company and are among a number controlled by this corporation in New York State.

The commission has granted the application of the Hoosac River Electric Light & Power Company for permission to exercise franchise in the village of Valley Falls, Rensselaer County. The company in question is a subsidiary company of the Schenectady Power Company and proposes to handle whatever power is distributed to municipalities or individual users along the line of the transmission line. The company expects to furnish light to Johnsonville and to take over the present lighting system in Schaghticoke.

Commissioner Eustis, of the New York City Public Service Commission, has conducted a hearing into the trackage and franchise rights of the Metropolitan Street Railway Company and the Central Park, North & East River Railroad Company, which operate a belt line of horse cars at the South Ferry terminal. The investigation was made at the instance of the Department of Docks and Ferries, which asserts that more roadway is needed for teams and vehicles desiring to enter the ferry. Mr. George W. Linch, manager of the Central Park, North & East River Railroad Company, said that the plan was satisfactory to him. It was brought out that the Metropolitan is now using two of its tracks at the South Ferry terminal without apparently a reason that satisfied him as to their right to do so. There were, he said, horse-car tracks which had been electrified by the Metropolitan for terminal purposes, and gave the Metropolitan the use of five tracks at South Ferry for its roadway on the Sixth and Eighth Avenue lines. Further investigation will be made to determine the Metropolitan's right to the tracks and to find out if it will agree to the plan of the Department of Docks.

As the result of the decision of the Appellate Division of the Supreme Court in ordering the New York City Public Service Commission to grant the South Shore Traction Company a franchise to cross the Queensborough Bridge, which the commission had previously refused, the power of the commission in regard to transportation matters has been questioned. In the amended Travis-Robinson act the power controlled by the commission is as follows:

1. Companies seeking franchises for surface lines make application first to the Board of Estimate; if it is entertained the terms and conditions of the franchise are fixed and the grant made. The company then applies for the approval of the commission.

2. Companies seeking to construct rapid transit lines, subway or elevated, must first apply to the commission; if approved by that body a certificate is prepared, fixing terms, etc., and is then submitted to the Board of Estimate. This applies to lines to be built by private capital.

3. When a subway or other rapid line is to be built as a municipal route, the project also has its initiation with the commission.

4. The commission is empowered by the new law to lay down routes for rapid transit lines, subject to approval by the Board of Estimate.

## Massachusetts Commission News.

The Fitchburg Gas & Electric Light Company has petitioned the Massachusetts Gas & Electric Light Commission for authority to issue 3850 shares of new stock at a price of $80 each to pay floating indebtedness already incurred for new construction, extensions and improvements, and to acquire additional plant and property. The par value of the stock is $50, and this is the first case in which the Fitchburg Company has taken advantage of the new law of 1909 which enables the directors of a gas or electric light company to fix a price for new shares of stock to be issued under approval of the board. The total amount of the proposed issue is $308,000.

The Malden & Melrose Gas Light Company has petitioned the Gas and Electric Light Commission for the right to issue 2306 shares of new stock at $140 each, the par value being $100. The money is to be used to meet floating indebtedness and in the purchase of additional plant. The total amount involved is $322,932.

## Standards of Electric Service in the State of Wisconsin.

The provisions of the public utilities law relating to standards of service for public utilities operating in Wisconsin read as follows:

"1. The commission shall ascertain and fix adequate and serviceable standards for the measurement of quality, pressure, initial voltage or other conditions pertaining to the supply of the product or service rendered by any public utility and prescribe reasonable regulations for examination and testing of such products or service and for the measurement thereof.

"2. It shall establish reasonable rules, regulations, specifications and standards to secure the accuracy of all meters and appliances for measurements, and every public utility is required to carry into effect all orders issued by the commission relative thereto."

With a view to performing the duties imposed upon the commission by the above laws, the experts of the engineering staff undertook comprehensive laboratory and field investigations. These investigations took the form of a general study of operating conditions, including a study of meter accuracy, variations in pressure, interruptions of service, lamp renewals, gas and electric lighting. In this work the commission had the co-operation of the United States Bureau of Standards and the committee of standards of the American Gas Institute in fixing standards of service tests.

Determinations of the accuracy of gas and electric meters, of the variations in gas and electric pressure, as well as the calorimetric tests of gas, were made in a number of cities throughout the State.

After sufficient progress had been made in different lines of investigation to reflect the general situation in the State, a conference of representatives of gas and electric companies was called for the purpose of arriving at a better understanding of the problems involved in the establishment of standards for

gas and electric service. This conference, as previously reported in these columns, was held at Madison, March 3, and was attended by about 200 representatives of gas and electric companies, as well as by other experts from different parts of the country.

From the results of this conference a set of rules and regulations was formulated, which are now published for the guidance of the managements of the various electric companies in Wisconsin. It is recognized by the commission that certain plants are operated under conditions which make it impracticable or not to the best interests of the public to meet all the requirements of all the rules. In such cases the commission may modify the rules if the evidence in the case warrants it.

The rules and regulations adopted by the commission in reference to electric service are of such a character as to insure adequate service to the majority of consumers with the fewest number of restrictions. It was recognized that the rapidly changing conditions to which the electrical energy supply industry is subjected would make it impracticable to formulate rules at this time which might interfere with the natural growth or progress of the industry.

Adequacy of electric service may be considered under the following classifications: (1) Accuracy of meters; (2) regulation of pressure, and (3) efficiency of devices for utilizing electrical energy.

A meter is considered accurate if it does not register on no-load, and if the error is not in excess of 4 per cent on light load, half load or full load. The commission requires that each central station shall make periodic tests on its meters, according to such methods as the commission shall approve. Each company is required to maintain a record of time, duration and cause of all interruptions of service upon its entire system or major divisions of its system. Also each company "shall adopt and maintain a standard average value of voltage as measured at any consumer's cut-out, which shall remain constant from day to day, and vary during any day by an amount not more than 6 per cent of the minimum value."

A 6 per cent variation is rather excessive and it is probable that a closer regulation will be required in the future. Under the changing conditions at present it appears that a rigid enforcement of this requirement will result in a marked improvement in the quality of service which has hitherto been furnished by the majority of companies in the State.

As has been amply verified by the inspectors on the engineering staff of the commission, much of unsatisfactory electric service comes from neglect on the part of the electric company or from lack of information on the part of the consumer as to some of the characteristics and practical limitations of electric lighting. The foregoing rules will help to remedy the former, while as regards the latter the commission has decreed that, "Each company supplying electrical energy for incandescent illumination shall adopt and maintain some method which will insure periodic inspection of incandescent lamps to which current is supplied, and under which the company will render its consumers assistance in securing incandescent lamps best adapted to the operation of the system. Each company shall submit to the commission the details of such method of procedure as it may adopt." Also, "Each company shall specifically inform each of its consumers as to the conditions under which efficient illuminating service may be secured from its system." As the progress of the art advances many changes and modifications of the definitions of adequate service and of the rules for obtaining the same will undoubtedly be necessary.

Upon an investigation of the Hudson Water Works by the commission it was found that the above concern had ordered every consumer to buy or rent an "Empire" meter. Also that in certain cases consumers who owned "Niagara" meters were ordered to replace them by "Empire" meters or suffer the penalty of having their water turned off. It was brought out at the hearing that the "Niagara" meters were acknowledged by the water board of Hudson to be equal in point of service to the "Empire" meters. The city charged its patrons $1.50 per month rental and charged $11.60 for the "Empire" meter while the "Niagara" meter could be bought for $7.10.

The point at issue was as to whether the water board had the right to compel a consumer to purchase and install a type of meter acceptable to it and to it alone. According to one section of the public utilities law, "It shall be unlawful for any public utility to demand, charge, collect or receive from any person, firm or corporation less compensation for any service rendered or to be rendered by said public utility in consideration of the furnishing by said person, firm or corporation of any part of the facilities incident thereto; provided nothing herein shall be construed as prohibiting any public utility from renting any facilities incident to the production, transmission, delivery or furnishing of heat, light, water or power or the conveyance of telephone messages and paying a reasonable rental therefor." This section of the law has come up many times in connection with telephone companies and it applies equally well to electric companies and all other public utilities. Under this law a city or corporation cannot give a lower rate to a consumer who owns his meter than to another consumer whose meter is owned by the city or corporation. The law contemplates that the divided ownership of parts of the equipment of public utilities shall cease, and that all responsibility for the installation and maintenance of the whole of the equipment shall be centered exclusively in the management. This means that private and municipal plants must acquire by purchase or lease all meters used in connection with their respective works. No utility can compel a consumer to acquire by purchase or lease a meter or any other part of the facilities which the utility is expected to furnish. Consequently it was held that the city of Hudson had no right to compel a consumer to use any kind of a meter, much less a particular type of meter.

On March 24 a hearing was held before the commission to consider the application of the Stoughton Electric Light & Power Company for authority to increase its rates. The company desired a more flexible rate which would enable it to sell more power to factories and large current consumers. The commission made a careful examination of the companies' earnings and expenses in order to determine the unit costs as a basis for rates. Although this is a municipal plant, the commission held that the expenses should be increased by tax, depreciation and interest charges in order to arrive at a reasonably safe basis for rates, although taxes and interest charges may, in a sense, be dispensed with in municipal plants. The commission granted the company authority to increase its rates.

The village of Cashton petitioned the commission for the determination of a just compensation to be paid to the Cashton Light & Power Company by said village, for the purchase of the companies' property actually used and useful for the convenience of the public. The Cashton Light & Power Company operated a pumping plant and flour mill in conjunction with the lighting plant, and it was evident from the testimony that the electric plant, as an independent enterprise, could not be conducted profitably, even if the most rigid economy were practised. In fixing the compensation to be paid the company, the following were some of the points brought out by the commission:

(1) "That in placing a value upon the physical property of a plant, the units of a plant should not be valued as independent entities, but as units of a going concern performing public-utility service.

(2) "That while the law imposes upon the municipality the obligation of purchasing only such property as is both actually used and useful for the convenience of the public, nevertheless just compensation must be provided for any articles of property which, although not of any use to the municipality, would be lessened in value by the removal of the lighting system.

(3) "That the element of 'going value,' created by the investments made in developing the business and in addition to

the cost of the physical structure, must be taken into consideration in fixing value; that, although the franchise of a public utility operating under an indeterminate permit has expired upon the exercise by the municipality of its option to purchase, the plant is to be taken over as a going concern, and just compensation must be awarded for the property taken as a living and operating entity, engaged in serving the public, and not as a mere plant without patrons and without privilege or right to operate and to serve the public, and having but a salvage value."

The compensation fixed by the commission was based largely upon the above facts.

A hearing upon a petition signed by citizens and telephone subscribers of Black Earth, Wis., alleging inadequate service on the part of the Black Earth and Mazomanie telephone companies was held at the office of the commission on May 15. The petition alleges that the toll service between the two cities is very unsatisfactory, the overloading of the present circuit causing great inconvenience and often financial loss to business men from their failure to receive prompt service. The petition further alleges that the Black Earth telephone company has expressed its willingness to construct its share of an additional line, but that the Mazomanie telephone company had refused to coöperate in the same manner. It was stated at the hearing, by the manager of the Mazomanie company, that the present pole line was not strong enough to carry the additional circuit, and that an entirely new pole line would have to be constructed. After investigating the matter the commission issued an order commanding the two companies to construct an additional telephone circuit to connect the two exchanges, the same to be done within a period of 30 days.

In the case of Fullmer vs. Wausaw Street Railway Company the complainant alleged unjust discrimination in the arrangement of fare zones and excessive rates of fare. The petitioner conducts a pleasure resort a short distance outside the city, and the fare charged by the respondent company was 10 cents per trip. This was also the fare charged to the pavilion—a resort owned by the railway company—although the pavilion was nearly two miles farther along the line. The petitioner testified that before the pavilion was operated, his place of business had been very popular, but that now, on account of extensive advertising and low transportation charges, the crowd had been diverted from his pleasure resort to the company's pavilion. It was brought out at the hearing that the published rates of the company called for a 15-cent round trip fare to either of the resorts. But the companies' tariff rates also specify that the 15-cent rate to the companies' pavilion includes a skating privilege. Thus, while the nominal rate of 15 cents applies also to the petitioner's place of business, the company is in reality paying a rebate in the shape of a skating privilege—worth probably 5 cents—at its own amusement park.

The commission recognizes the fact that the fusion of commercial and transportation enterprises is frought with grave dangers, and that it is highly desirable to divorce the railway business absolutely from all pursuits in the domain of competitive industry and to confine itself exclusively to the primary function of transportation. With this end in view and after a careful examination of the companies' receipts and expenditures, the commission ordered that the Wausaw Street Railway Company shall not charge more than 5 cents per trip between any two points on its line. It was further ordered that the company shall cease from publishing any tariff and collecting fares, either single or round trip, which include the charge for the admission of the holder of the ticket to the company's pavilion or other amusement resort operated by it. It is not the policy of the commission to discourage investments in public utilities and if it is evident at the end of six months that the above 5-cent rate will not return a reasonable amount upon the investment, the commission will entertain a request for an increase in rates, provided it can be shown that the above rate is actually too low.

## CURRENT NEWS AND NOTES.

*NAVAL POST-GRADUATE COURSE IN ELECTRICITY.*—It is reported that the Secretary of the Navy is considering the establishment of a post-graduate course in electrical engineering for commissioned naval officers. The present electrical course at Annapolis for midshipmen is a training course which deals more particularly with the routine operation of electrical apparatus and devices.

*BALTIMORE METER TESTING ORDINANCE.*—A Baltimore ordinance has gone into effect which provides for the compulsory inspection of all electric meters before installation, and a charge of 10 cents for each meter is imposed for this service. On complaint of a patron an inspection will be made at any time, and a charge of $1 is made, to be borne by the company if the error is ascertained to be more than 4 per cent, and by the patron if less.

*CHINESE TECHNICAL STUDENTS.*—The Chinese Board of Education has under way the establishment of a preparatory school at Pekin to fit students for entry into American colleges. One hundred graduate students from the school will be sent annually to America, 80 of whom will enter technical courses, and 20 will take courses in political science, finance and pedagogy. Until the school begins to turn out graduates the annual quota will be chosen at a special examination in Pekin, the first of which will soon be held.

*PHILADELPHIA ELECTRICAL SHOW.*—Plans are being perfected for a Philadelphia electrical show, to be held in the First Regiment Armory, Broad and Callowhill streets, Feb. 15 to 27, 1910. An artistic scheme of decoration has been adopted, a feature of which is a representation of Franklin and his kite, the latter being outlined by lamps near the roof and connected by a string of lamps to a statue of the philosopher. The exhibition will be under the management of the Electrical Exhibition Company of America, with present offices at 1522 Chestnut Street.

*MAINE ELECTRICAL ASSOCIATION.*—The first annual convention of the Maine Electrical Association, which will be held at Portland, July 29 and 30, will have several enjoyable social features. The Portland Electric Light Company will on the first evening of the meeting entertain the members at a dinner, and later at the theater. On the following day there will be an excursion about the harbor in a steamer, followed by a clambake. Twenty central stations have already joined the association, and a convention attendance of 150 to 200 is anticipated. Mr. Fred. D. Gordon, Auburn, is secretary of the association.

*BOTTLED ELECTRICITY.*—A Baptist clergyman, of Bayonne, N. J., who is described as a scientific student, who has contributed largely to technical magazines, announces that he has discovered a method for the elimination of thunderstorms, and of storing on earth part of the electricity in the clouds. His plan is to construct a huge steel tower reaching to the clouds, down which silently and harmlessly would be conducted the immense quantities of electricity to be there stored. All that would be necessary, he says, would be three city blocks on which to build a solid foundation. "There are 10,000 million volts of electricity in every flash of lightning two miles long. Bottle up this immense energy in storage batteries and sell it and in a year's time you could buy out Rockefeller. The clouds are charged with electricity and the supply is inexhaustible. By the use of such a tower and proper storage facilities thunderstorms in cities would be eliminated. I predict that within the next few years every city in the United States will build one large steel tower in its territory and will run its street cars and large power plants by only that energy drawn from the clouds."

*TELEGRAM FILING TIME.*—The Postal Telegraph Company is now, in accordance with a decision of the Court of Appeals of Maryland, complying with a law passed in that State requiring the time of filing of messages to be endorsed without charge on all messages delivered.

*COLORADO ELECTRICAL ASSOCIATION.*—The annual meeting of the Colorado Electric Light, Power and Railway Association will be held in Denver Oct. 7 to 9, coincident with the meeting in that city of the American Street and Interurban Railway Association. Mr. J. C. Lawler, Colorado Springs, is secretary of the association.

*WIRELESS TELEGRAPH FOR BOSTON POLICE.*—A recent wireless-telegraph installation has been erected by the Boston Police Department on top of the headquarters office of the force in Pemberton Square. The apparatus was constructed by members of the department having a mechanical bent and considerable success has been obtained in picking up night messages. A sending outfit is now in process of installation. This is thought to be the first wireless outfit of the kind in the country.

*WIRE-TAPPING SCHEME DISCOVERED IN BOSTON.*—Under the investigations of Superintendent John Campbell, of the special service department of the Edison Electric Illuminating Company, a wire-tapping scheme has been brought to light in Boston and the police have made an arrest in the case of an employee of the company, who is charged with unlawfully diverting a current of electricity for the benefit of certain customers. The scheme was the usual one of trying to by-pass the meter. Other arrests are expected.

*ONE HUNDRED THOUSAND-VOLT COLORADO TRANSMISSION.*—The full 100,000 volts was temporarily thrown on the Denver substation of the Central Colorado Power Company July 10. A secondary was connected for a few minutes to try-out connection with the steam stations of the Denver Gas & Electric Company in Denver, and a portion of the Denver load was carried by the power plant in Shoshone, nearly 200 miles away. This transmission is a portion of a general plan of water-power developments and transmissions being systematically developed.

*CITY COMPENSATION FROM COMMONWEALTH EDISON COMPANY.*—For the first full year since its formation, the Commonwealth Edison Company has paid into the city treasury of Chicago the sum of $269,752.15 as the compensation required by its ordinance. This is 3 per cent of the gross receipts of the company for the year ended June 1, 1909, and 10 per cent of the rentals of conduit space, the latter, however, being only a small proportion of the total amount paid. The gross receipts of the company for electric service during the year were $8,970,634. An advance payment of $100,000 was made to the city several months ago, on request, so that the check recently forwarded was for the remainder.

*BOSTON ELECTRICAL SHOW.*—At a meeting held June 29 by a number of gentlemen representing important electrical interests in America, it was decided to form an association along strictly mutual lines for the purpose of holding an annual electrical exposition in Boston. It was decided that to make an exhibition of this character of the greatest interest to the general public, with a consequent business gain to the exhibitors and the electrical trade in general, it should be conducted on a mutual basis insuring co-operation, and a plan to that effect was adopted. It was further decided to hold the first exposition in Mechanics' Building, Boston, on the only available dates, Nov. 15 to 25 (inclusive), 1909. Mr. Chester I. Campbell, 5 Park Square, Boston, is acting secretary.

*WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS.*—The executive committee of the Western Association of Electrical Inspectors has selected Oct. 26, 27 and 28 as the date of the 1909 annual convention to be held at Detroit, Mich. The headquarters hotel will be selected later. Addresses arranged for as follows: "Municipal Control of the Electrical Hazard," by Mr. James E. Cole, Wire Commissioner, Boston, Mass.; "Relation of the Manufacturer to Electrical Inspection Work," by Mr. Alexander Henderson, of the American Circular Loom Company; "The Technical Press and Its Relation to Electrical Inspection Work," by Mr. Jas. B. McCarthy, president Electrocraft Publishing Company. The secretary of the association is Mr. Wm. S. Boyd, 152 Monroe Street, Chicago, Ill.

*CORPORATION TAX.*—Advices from Washington state that an agreement has been reached in regard to the proposed tax on corporation income to be included in the new tariff bill. The chief changes are the reduction of the levy from 2 per cent to 1 per cent of the net earnings of corporations and the elimination of the Clapp amendment, which included holding companies within the scope of the tax. Other modifications are made harmonizing the different exemptions in regard to insurance companies and other ordinary concerns. The amendment will take the place of the House inheritance tax provisions in the formal report of the conference between the House and Senate. The changes have been approved, it is said, by Attorney-General Wickersham after conference with the President.

*AMERICAN RAILWAY ASSOCIATION'S COMMITTEE ON ELECTRIFICATION.*—The American Railway Association has announced the names of the members of the new committees chosen under the new constitution. The committee on electrical working, which will investigate and report on the progress made in the electrification of steam railroads, is composed of Mr. George Gibbs, chief engineer of electric traction, Long Island Railroad, chairman; Mr. L. C. Fritch, consulting engineer of the Illinois Central; Mr. J. F. Deems, superintendent of motive power of the New York Central Lines; Mr. J. D. Isaacs, consulting engineer, Union and Southern Pacific system; Mr. W. J. Harahan, assistant to president, Erie; Mr. C. S. Sims, second vice-president, Delaware & Hudson, and Mr. E. H. McHenry, vice-president, New York, New Haven & Hartford.

*OUTING OF CONTRACT DEPARTMENT OF COMMONWEALTH EDISON COMPANY.*—Members of the contract department of the Commonwealth Edison Company, to the number of 130, enjoyed the annual dinner and outing of the department at Riverview Park, Chicago, on the evening of July 13. The party proceeded to the park on special cars and sat down to an excellent dinner. There were no speeches, and after dinner the men were furnished with tickets to the various shows in the amusement park. Members of the party enjoyed themselves heartily and informally and were grateful for the courtesy of the company, which defrayed all the expenses of the entertainment. Mr. E. W. Lloyd, general contract agent of the company, was the chief guardian of the flock, and Mr. Louis A. Ferguson, Mr. John F. Gilchrist and other heads of departments were present as guests of the contract department.

*AUDITORS' REPORT IN CHICAGO TRACTION REHABILITATION.*—The expert accountants employed by the Mayor of Chicago have made their report after auditing the accounts of the Chicago Railways Company, following the recent controversy in which the Board of Supervising Engineers was involved. The report of the Mayor's auditors in relation to the accounts of the Chicago City Railways Company was made some time ago. The more recent report goes into the subject in detail, and the major portion of the report is taken up with a discussion of interest, principally whether the city is not entitled to interest when the company does not settle its partnership account with the city promptly on the date fixed in the ordinance. In relation to alleged rebates from manufacturers, which aroused so much discussion a few months ago, the present report says that only one instance of such a rebate was found in the case of the Chicago Railways Company, and that was for a comparatively small amount.

# Underground Cable System in a Village of Two Thousand Inhabitants.

BY J. FRANZ.

IT is a well-known fact that underground cables are most desirable; and to undertake their installation in connection with a lighting plant in a small summer resort where only a night load is obtainable is a daring proposition. Large summer residences do not furnish as profitable an income to central stations as stores, apartment houses, etc. The installations in the former are large and the consumption comparatively small which means large cost at first for transformers, meters, lamps, etc., and increased core losses. The apparatus could be small enough for the average load were it not for the fact that on special occasions, such as parties and dinners, when the house is filled with guests, the installation is used to its full capacity. In the face of such conditions the Stockbridge Lighting Company, of Stockbridge, Mass., undertook to establish a plant with a capital of $25,000.

Two miles from the town there is a reliable water-power plant which offered to furnish electrical energy at a reasonable price. After due consideration the water-power company proposition was accepted rather than build a power station. A two-phase, 2400-volt, 66-cycle, four-wire, No. 6 transmission line was built, mostly on private right of way, to the nearest available point of the village, and a few consumers were taken on the trunk line. In order to obtain a suitable switch house, the company co-operated with other interests in building a small concrete structure (Fig. 1), one-half of which the Berkshire Street Railway Company uses as a waiting station, the other half being used as a switch house. The floor of this part is 6 ft. x 12 ft., the building being 10 ft. high. In this room is installed a Westinghouse marble switchboard having six outgoing, double-throw, double-pole oil switches, and two busbar switches, all of which are protected by cartridge plug fuses. There are also entrance switches, lightning arresters, and choke coils, all of the Westinghouse make, and a General Electric 8½-kw, constant-current transformer and panel, supplying a street-lighting system. From this center of distribution leave three No. 6 twin-conductor cables carrying 2400 volts, single-phase current to the three principal streets of the village. These cables, made by the National Underground Cable Company, are paper insulated. There is also a No. 6 twin conductor cable, cambric insulated, carrying 1000 volts, made by the Standard Underground Cable Company, to supply the street lamps. Two single-phase pole lines leave the station and feed the remotest houses, and also an overhead line for the street lamps on the outskirts.

The taps of the primary cables are carried direct into the houses to transformer vaults built of brick or concrete, with iron-lined doors. Conduits of fiber were used, being overlaid with a 3-in. covering of concrete. Most of the manholes are blind, being 2 ft. x 3 ft. x 3 ft., built of cement with cast-iron covers. A majority of these manholes are situated in lawns at the road side. Open manholes are only used from the switch house to the main street where five ducts are laid. There are only two ducts through the other streets. Draining the manholes was unnecessary, except in a few places, for the soil is of a gravel or sandy nature and, therefore, allows the water to escape freely. This made a substantial underground system at a minimum expenditure.

Three miles of double duct were laid with only 50 consumers connected, and with a possibility of 50 per cent increase. It is easily seen that secondary distribution was impracticable on account of consumers being too far apart. Where it was possible, more than one house was supplied from the same transformer. Two of the cables are continued overhead on pole lines, the cable ends being protected similarly to those at the switch house. The overhead lines cover about four miles of streets and are built according to standard construction rules; 30-ft., 8-in. top, chestnut poles being used and set at distances not over 130 ft. apart.

This work was completed in the fall of 1907 at a total cost of about $23,000. In the spring of 1908 the company was awarded a contract for public lighting to install 95 32-cp lamps, 51 to be connected with the underground cables, the remaining 44 being strung from the pole lines. Tungsten 5.5 amp lamps are used. The company receives nearly twice as much per year for each street lamp supplied from the underground system as for the lamp supplied from the pole line. A lamp-post is shown in Fig. 2. A No. 10 lead-covered cable tap is carried direct to the head of the post. The sheathing is permanently grounded to the lamp-post. As no loop-lines were possible there is a total of 14 miles of series lines.

FIGS. 1, 2 AND 3.—LIGHTING IN A VILLAGE OF 2000 INHABITANTS.

At three principal street intersections special lamp-posts (Fig. 3) are used. In the base of each are installed test switches. Similar switches are employed on the overhead lines making it much easier to find trouble on the line than if there were no sectional cut-outs. The lamp-posts vary in distance from 200 ft. to 400 ft. apart. While lamps at such distances do not illuminate the street brilliantly, sufficient light for a country town is obtained in marked contrast to the former oil lamps, which were placed at irregular intervals all over the village. The electric service is highly appreciated by all the residents. The cost of installing the underground street-lighting system was less than $8,000, and the 45 overhead lamps cost the company less than $3,000. The management has recently declared a small dividend from first year's earnings, so that the installation evidently pays. The officers of the company are: Mr. Allen T. Treadway, president, and Mr. Charles E. Hull, treasurer and manager. The Rogers Electric Company, of Lenox, Mass., was the contractor and had entire charge of the work.

# The Power Plant of the University of Alabama.

By F. H. Sibley,
*Professor of Mechanical Engineering.*

THE University of Alabama is located at Tuscaloosa, a town of about 10,000 inhabitants, 50 miles southwest of Birmingham, in the heart of the coal and ore regions of the State. The campus covers a tract of about 400 acres, and is situated on the south bank of the Worrior River, a stream upon which the U. S. Government is spending several millions of dollars on the construction of locks in an effort to carry navigation from Birmingham to the Gulf. The location of the university is a fortunate one from both an esthetic and a practical standpoint. The region is high and healthful, the natural beauties of the country are great, and the campus itself, while at present undeveloped, offers some very attractive problems for the landscape engineer. On its practical side, the rapid growth of the Birmingham district, which is assured by the great deposits of ore, coal and limestone, all within easy reach of each other, promises to make this an ideal location for a school for the training of young engineers.

The university has been offering courses in civil engineering for 25 years, and there is a present enrolment of about 50 students. About two years ago a movement was started to develop the engineering department. The State Legislature appropriated $500,000, a considerable portion of which has been used for this work. A two-story building having a ground area of a little over three-quarters of an acre has been erected, and schools of mines, mechanical and electrical engineering have

FIG. 1.—ENGINEERING BUILDING, UNIVERSITY OF ALABAMA.

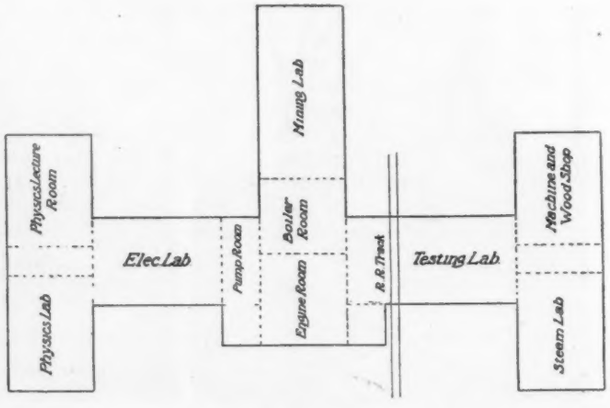



FIG. 2.—FIRST FLOOR PLAN, COMER HALL.

been established. Fig. 2 shows the ground plan of Comer Hall, the new engineering building, which is illustrated in Fig. 1. The middle portion is occupied by the power plant, which was designed to furnish energy for heat and light for the university and for the motors which are in use in the various shops and laboratories.

The boiler room contains two 150-hp water-tube boilers. One boiler is of the Erie City type, having the furnace fitted with a Jones underfeed stoker. The other boiler was built by the Walsh & Weidener Company, of Chattanooga, and has a Burke shaking grate stoker of the Dutch oven type. The boilers were built to carry a working pressure of 125 lb. and guaranteed to 200 lb. The steam piping is standard weight, as manufactured by the Crane Company, with medium-weight fittings.

The main generating unit in the engine room is a 160-hp Allis-Corliss engine, directly connected to a 100-kw Bullock generator. The steam and exhaust valves are operated by separate eccentrics, and the engine is designed to run either condensing or non-condensing. The secondary steam unit is a 40-hp high-speed engine belted to a Triumph generator. This unit is large enough to handle the minimum day load of the shops and laboratories when the lamps are not in use.

The generators are wound for an electromotive force of 240 volts. A part of the lamps at the university have been installed on the two-wire system and part on the three-wire system. Both of the generators being of the two-wire type, two small motor-generators, one rated at 10 kw and the other at 3.5 kw, are used to balance the load.

The exhaust steam from the engines is passed through an open heater which is located in the pump room, adjacent to the boiler room, and thence into the heating system. When the supply of exhaust steam is not sufficient to heat all of the buildings, live steam from the boilers is supplied around the heater through a by-pass and a pressure-reducing valve. Steam for the several buildings is supplied through a 6-in. main laid in a concrete conduit. The presssure in the mains is 30 lb., and this is further reduced at the various buildings to about 15 lb. per square inch. The radiation is of the vacuum-return type, the return water being brought back to the heater by a vacuum pump, where it comes in contact with the exhaust steam and is then pumped into the boilers.

The switchboard is designed for three generator panels, two balancer panels and two distributing panels. The instruments are of the Wagner round type and the switches are of the front-fused type. The current is carried through an underground cable to a junction pole, about 200 ft. from the switchboard, from which the leads to the various circuits are taken. Each circuit is controlled by a separate switch in the engine room.

In addition to the generator units already described there has been installed, largely for experimental work, a 35-hp gas producer plant. This plant was built by the Fairbanks-Morse Company, and was designed to handle, at least in an experimental way, any Alabama coal as well as coke and anthracite. The plant is unique and interesting in this particular, because no attempt had previously been made to burn hard and soft coals as well as lignites in the same generator. The special features are a combination of the company's regular anthracite generator with a tar extractor and purifier. The gas generator is larger than is generally furnished with a 35-hp plant, being the one generally installed with a 75-hp plant. When running with soft coals it is planned to use steam from the vaporizer under the grate to keep the temperature of the fire down and prevent clinkering. It will also be necessary when using soft coal to remove the lower magazine to prevent coking in the upper part of the generator. For lignites the generator will run complete as equipped, either with or without the vaporizer. For anthracite and coke the tar extractor is cut out.

The engine furnished with this plant is of the horizontal, straight-line, four-stroke-cycle type, and makes 275 r.p.m. Water for the cylinder jackets is supplied directly from the mains. A 1-hp air compressor is belted to the main shaft, delivering air at 130 lb. pressure to a receiving tank just back of the cylinders. This compressed air is used for starting the engine. The engine is belted to a 30-kw, direct-current generator running at 900 r.p.m.

It is proposed to make exhaustive tests with the gas producer plant in comparison with either the high-speed or low-speed steam unit, under the same conditions and with the same

fuel, and to demonstrate if possible the advantages of the producer, considering cost of operation, maintenance, stand-by losses and fuel. Furthermore, it is proposed to test the Alabama lignites in comparison with other fuels. The State of Alabama has a large available supply of lignite coal as yet practically unused. It has been estimated by Dr. Wm. F. Prouty, assistant State geologist, that the lignite in Alabama represents about 19,500,000,000 tons.

Comer Hall provides quarters for the department of physics and the four departments of civil, mechanical, electrical and mining engineering. The civil engineering department at present includes the work in mechanics and hydraulics. The south end of the building is occupied by this and the physics department. A full line of surveying instruments has been provided, and the equipment in offices and class rooms is suitable for the accommodation of probably 150 students in surveying. The physical testing laboratory was equipped by Tinius Olsen and Purdue University. It includes a 200,000-lb. testing machine, wire, torsion, drop and impact machines. The civil department also has a fairly complete outfit for testing cements and road materials. A spur track enters the building in this laboratory, and a pit is being constructed for locomotive tests.

The hydraulic laboratory and pump station are located on the University Branch of the Worrior River, a small stream having an average daily flow of 400,000 gal. A concrete dam has been built across the creek, giving a head of about 15 ft. and a storage of approximately 3,000,000 gal. The lake so formed will add much to the natural beauty of the campus.

The combined power house and laboratory is of concrete 30 x 40 ft. in dimensions. It contains a 10-hp Trump turbine belted to a 50-gal. triplex pump. A 10-hp motor has also been installed, so that the pump can be operated in dry weather. The water supply for the university is collected by gravity from springs in the hillside and pumped through a 6-in. force main to an 80,000-gal. tank, from which it flows to the distributing mains under a pressure of about 40 lb. per square inch. Under the floor of the pump house are constructed various tanks and movable weirs for measuring and controlling the flow of water for experimental work.

The electric laboratory occupies a room 80 ft. x 50 ft. adjacent to the physics department. The equipment for this laboratory has not yet been purchased, but as projected it will provide facilities for the usual laboratory practice in the testing and operation of motors and generators, lamps, storage batteries, transformers, insulators, etc.

The department of mechanical engineering occupies the north wing of the building. On the second floor are located the offices, draughting and class rooms. On the first floor is a combined steam and transmission laboratory containing an engine for valve setting and apparatus for testing gages, calorimetry and flow of steam. Oil- and belt-testing machines, a traction and absorption dynamometer and various minor equipment are being installed. On the same floor is the machine and wood shop. These will contain lathes, a planer, milling machine, drills, shaper, band and wood saws, trimmer and jointer and all small tools usually found in machine and pattern shops. A small forge shop and a foundry will be fitted up in a building in the rear of Comer Hall. These shops, taken in connection with the equipment proposed for the mining laboratories, will make it possible to illustrate every process in the manufacture of iron and steel from the ore to the finished machine. The shop and laboratory work is so planned that for the immediate future students will be occupied in constructing additional equipment under the supervision of skilled mechanics, and later on some simple machine will be selected and the time of the students in shop practice will be employed in its construction. The mining laboratory occupies the central wing of the building in the rear of the power house. The machinery for this laboratory was furnished by the American Concentrator Company. It is operated by a 70-hp motor and includes crushers, elevators, jigs and screens suitable for handling any of the Alabama mine products on a commercial basis. Smelting and assay furnaces will be added to the equipment in the immediate future. This mining equipment has attracted considerable attention from the manufacturers of the Birmingham district and already the officials of the United States Steel Corporation of the South have signified their intention of co-operating with the university in its further development.

Under normal conditions the demand for technically trained men in the Birmingham section greatly exceeds the supply. With the up-to-date engineering schools provided by the university, free from obsolete and useless equipment, with courses laid out in conformity with the best technical school curricula in the country and with experienced instructors in the shops and laboratories, it is hoped that young men from other parts o fthe South as well as Alabama will be attracted by the opportunities offered.

## Electrical Devices for Handling Raw Material and Finished Product of the Indiana Steel Company, Gary, Ind.

One of the most prominent features of the equipment at the Gary plant of the Indiana Steel Company is the apparatus provided for handling the raw material. As shown in Fig. 1, along the slip where the ore is received in vessels, there are five monster ore unloaders and an equal number of bridges. Each unloader is of the grab-bucket type rated at 10 tons per lift, while each bridge is rated at 13 tons and is of the cantilever type. The former is equipped with six motors having a total rating of 435 hp, while the latter has 14 motors, the aggregate rating of which is 618 hp. The object of the bridges is to convey the ore to the point of use from a large concrete trough to which it is carried by the unloaders.

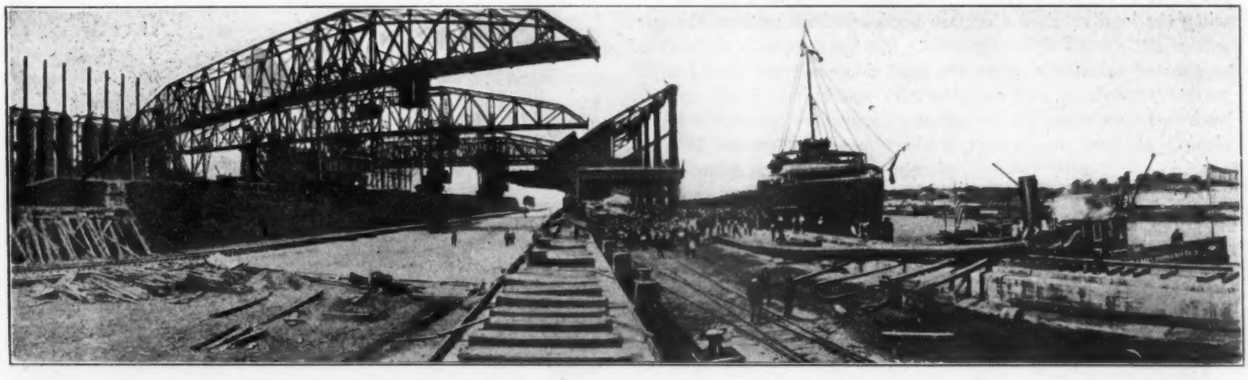


FIG. 1.—GENERAL VIEW OF ORE UNLOADERS AND BRIDGES AT GARY.

The master controller for operating the six motors on each unloader is mounted in a motorman's compartment arranged within the log of the unloader immediately above the bucket, the arrangement being similar to that shown in Fig. 2. Thus

the operators is able at all times to view the performance of the machine from the most advantageous position. No power other than that derived from electricity is used with the unloaders, all hydraulic cylinders, etc., having been dispensed with. Use is made of controlling mechanism which gives to the motors for opening and closing the bucket and for rotating the bucket the operating characteristics of hydraulic cylinders. Automatic

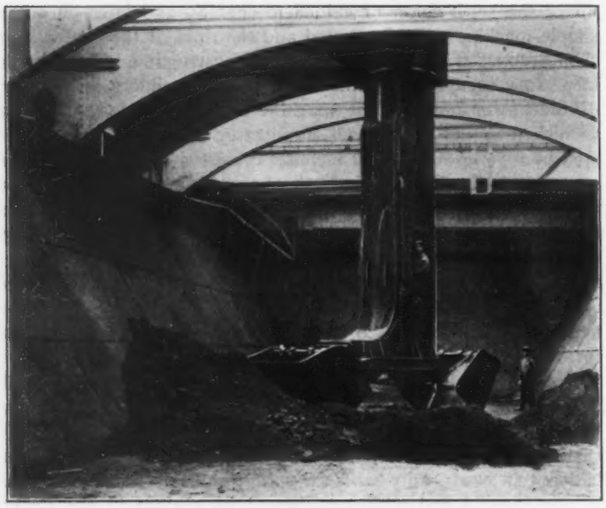


FIG. 2.—ELECTRICALLY OPERATED ORE UNLOADER.

"slow-downs" and "cut-outs" are provided for the trolley motors, so that the speed of the trolley automatically decreases as the bumping blocks are approached. Dynamic braking is employed on both the hoisting motors and the motors for moving the trolley.

In operating the bucket of an unloader it frequently occurs that more ore will be entrained between the jaws of the bucket than the bucket can hold, and as a certain pull cannot be exceeded without injury to the machine, owing to the fact that the bucket is suspended from the end of a steel leg some 40 ft. long, arrangement is made to limit automatically the torque of the motor. At the same time the controller is so arranged that when the load reached a certain predetermined amount the current is not cut off from the motor, but the torque is maintained at a fixed value, and when the load decreases the motor automatically starts up and completes the operation. In closing the bucket the operator simply throws the master controller to the closing position and leaves it there until the bucket is completely closed. In case the bucket grasps more ore than it can hold the operator simply starts the hoist motion, thereby allowing the surplus ore to drop from between the jaws of the bucket, at which time the motor again starts automatically and completes the closing operation. Lifting magnets have proved particularly advantageous for handling both the raw material and the finished product at Gary (Fig. 2). In the open-hearth stockyards, the cranes used for unloading pig iron and scrap from railroad cars are equipped with magnets provided with a controller so arranged as to cause the load to be released with great promptness. Current in a reversed direction is sent through the magnet winding when it is desired to release the load. It is said that the load is released in 0.6 second, while when this arrangement is not used 12 seconds are required for releasing the load. Skull-cracker cranes equipped with lifting magnets are in use at the open hearth and adjacent to the pig-casting machine for breaking up of defective castings and the skulls or chilled metal which accumulate on the linings of ladles used in handling molten metal. The cranes are mounted upon runways of exceptional height. Steel balls weighing approximately 12,000 lb. are used for breaking up the scrap and skulls. The material to be broken is unloaded from cars and placed on the ground by means of the magnet. A ball is then

FIG. 3.—ELECTROMAGNET LIFTING PIG IRON.

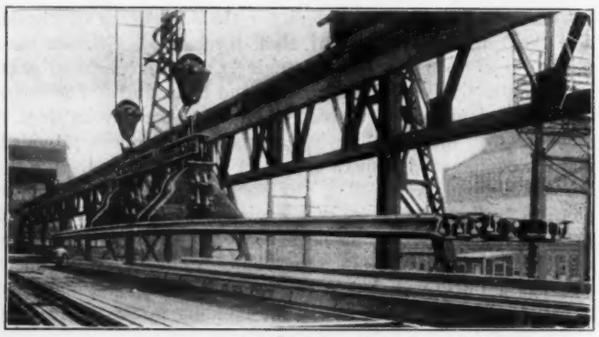


FIG. 4.—ELECTROMAGNET LIFTING 60-FT. RAILS.

lifted by the magnet and hoisted to a suitable height and merely throwing the magnet controller to the "off" position releases the ball, which does the work of breaking the material. The broken metal is then gathered up by the magnet and loaded into boxes for charging into the open-hearth furnaces.

There has recently been put into operation at Gary a pair of lifting magnets for handling the output of the rail mill. The shipping yard of the rail mill is spanned by two special electric cranes, each equipped with double hoisting drums. Fig. 4 illustrates a pair of magnets suspended from one of these cranes lifting 30,000 lb. of rails 60 ft. in length, while Fig. 5 shows the same pair of magnets lifting a double-locked or nested layer of rails 30 ft. in length, 23 rails being handled at each lift. In other words, 10 or 12 tons of rails are handled per lift, depending upon the section of the rail. With these magnets an ordinary car of rails can readily be loaded in from two to three

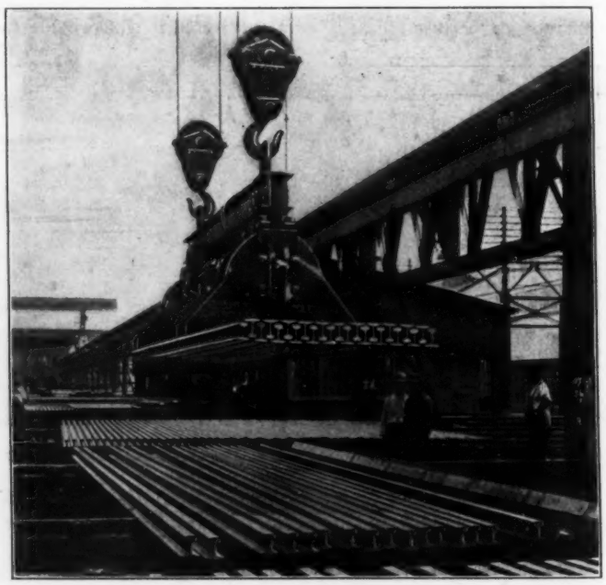


FIG. 5.—ELECTROMAGNET LIFTING A LAYER OF 30-FT. RAILS.

minutes. In addition to the saving in time and labor which is introduced by these rail-handling magnets a further advantage is gained in that owing to the wide spacing of the magnets the rails are not strained and there is no danger of giving them a permanent set in the process of handling.

For controlling the motors on the above-mentioned cranes, as well as those on the ladle cranes, charging cranes, soaking pit

cranes, stripper cranes, etc., use is made of ventilated grid controllers of the type devised by Mr. A. C. Dinkey when superintendent of the electrical department of the Homestead Steel Works. The controller is operated by a lever having a straight forward and backward motion. When properly connected, the motion of the lever indicates to the operator the direction in which the motor will run. For instance, in the case of a trolley on a crane, when the operator moves the lever from him the trolley moves across the bridge away from him, and when the lever moves toward the operator the trolley moves toward him. This arrangement is found to be very valuable particularly in cases where one operator must operate a number of controllers, and where confusion on the part of the operator might result in serious damage.

The above-described controlling devices and lifting magnets were designed and built by the Electrical Controller & Manufacturing Company, Cleveland, Ohio.

## Uniformity in the Photometry of Colored Light Sources.

By F. E. Cady.

In these days of high-efficiency illuminants the accurate determination of their intensity in terms of the standards in ordinary use is a question of considerable uncertainty, due to the difficulty of comparing photometrically lights of different colors. One of the principal objections to the Hefner as a primary standard has been its reddish color. The pentane, while not so bad in this respect, is still far from matching in color the Welsbach mantel. The introduction of the new metallic-filament lamps has only aggravated this difficulty and their rapidly increasing adoption makes it more and more imperative that they should be properly rated. It is highly desirable that the accuracy of photometric measurements in the comparison of light sources of the same color which has been so adequately demonstrated in the case of the carbon-filament secondary standards should be extended to the new types of illuminants.

The so-called "color" error has been a source of uncertainty to photometrists for many years, and the many efforts to obviate it are well known. Among these is the method of Crova, who by the use of colored glasses attempted to compare intensity in certain limited portions of the spectrum only. Many flicker photometers, no one of which has proved to be completely satisfactory, have been proposed in an attempt to solve the problem, using an entirely different principle.

There are two main reasons for the difficulty in photometering light sources of different color. First is the fact that when two contiguous surfaces illuminated by lights of different color value appear to one individual to be equally illuminated they may not appear so to a second individual. Secondly, it is much more difficult for an observer to decide when two such surfaces appear to be equally illuminated. The first condition might be met by averaging the results obtained by a large number of observers and calling this the value corresponding to a normal eye. The second might be met by taking a sufficient number of observations. The flicker photometer meets the second condition fairly well, but it has yet to be satisfactorily proved that the condition of equal illumination indicated by the flicker photometer is the same as that which would be determined by the normal eye working with the ordinary type of photometer.

There is a method which has been used at the Reichsanstalt,[1] and which has also been suggested by others, which may serve to meet both of the above conditions if properly handled. This method consists in the use of a glass color-screen on one side of the photometer so tinted that the illumination on the photometer screen is the same in color value as that produced by the source on the other side of the photometer. The conditions are then reduced to those ordinarily encountered in the photometry of sources of the same color.

If, then, a set of these screens differing in color value by small successive steps were prepared by the National Bureau of Standards and carefully standardized in accordance with the method described in the latter part of this paper, it would be possible for everybody so desiring to obtain accurate copies of these screens and thus eliminate the present lack of uniformity in the photometry of light sources of different color value. And it should be noted that such uniformity is much more important than the determination of the absolute candle-power value of a light source. Thus, it is evident that it is not so important to know whether a certain lamp has a value of, say, 16 cp or whether its value is 17 cp as it is to know that a lamp marked 16 cp by one manufacturer has the same illuminating power as a lamp marked 16 cp by another manufacturer. In other words, it is just as desirable to have uniformity in the rating of the new high-efficiency lamps as it was to have a common unit through which the old lamps have been brought into very good agreement.

It is evident that if such color screens are to be used they should have, among others, the following characteristics: First, the transmission should be uniform throughout; second, the tint should be the same throughout; third, the tint should be permanent and the transmission coefficient should remain constant; fourth, the surfaces of the plates should be very approximately plain and parallel. The last property becomes of especial importance when the screens are to be used under conditions differing somewhat from those under which they were calibrated. Fifth, it is desirable in order to have uniformity in the results obtained by different observers that the spectral absorption of the screen should be such that the color of the transmitted light is as nearly as possible spectrally identical with that of the light to be measured.

The method of using tinted color screens was introduced by Dr. E. P. Hyde at the Bureau of Standards during the incumbency of the author and was found to work very satisfactorily in determining the intensity of high-efficiency sources in terms of the standards of the Bureau.

A preliminary investigation led to the conclusion that it is necessary to subtract only a very small amount of the yellow, which is equivalent to adding a small amount of blue, to make a 4-watt-per-candle carbon lamp match a tungsten lamp in color. Through the courtesy of the American Optical Company, of Southbridge, Mass., a set of glasses combining most, if not all, of the above requirements, was obtained, of definite dimensions and graded in tint from a very light to a dense blue. These samples were marked from 1 to 6. It was then found by experiment that by using these, together with glasses having color values half-way between those given, it was possible to get a set of screens which would give a very fair color match in the photometer between the 4-wpc carbon on the one side and the 3.5-wpc carbon, the 3.1-wpc carbon, the 2.5-wpc Gem, the 2-wpc tantalum, and the 1.25-wpc tungsten on the other side.

Sets of these screens involving three different tints have already been calibrated at the Bureau and have not shown evidence of change over a considerable period of time.

The size of the screens was so chosen that they would fit tightly a brass case which was attached to one side, and always the same side, of the photometer head in such a way that no light could reach the photometer screen on that side without passing through the glass. Each plate was marked in one corner so that it could be placed in the brass case in exactly the same position whenever used.

In calibrating the screens there are several methods available, but that method which most nearly approaches the pure substitution method is undoubtedly the best. Thus, having as a standard a lamp whose voltage for a definite watts per candle is known, find the voltage of another lamp, called the comparison lamp, to be used on the other side of the photometer at which it matches the standard in color. Now place the color screen in position and take a set of readings. Then remove the color

[1] "Praktische Photometrie," Liebenthal, p. 231.

screen and place on the same side of the photometer a sectored disk with an opening such that the intensity on that side is cut down to approximately the same value as that given by the color screen. The determination of the coefficient of absorption of the color screen is then a simple matter.

This method of calibration is as purely substitutional as it is possible to make it. The readings of the photometer come at the same point on the bar, thereby eliminating errors due to distance measurement, inequality in the ways, etc. All the conditions, aside from the use of the sectored disk and the color screen, are exactly the same. On account of the possibility of errors due to the Purkinje effect it would be highly desirable to standardize the color screen at a definite absolute illumination.

The method of calibration may be still further amplified by not attempting to calibrate the given screen directly, but by a step-up process involving one or more screens of colors intermediate between that of the standard and the glass to be calibrated. This method involves the possibility of multiplying errors, but it may be that the result would even then be more accurate than that obtained by the direct measurement.

Up to this point the color difficulty has not been eliminated, for the same sources of errors are present in the determination of the transmission coefficient of the color screen as enter into the measurement of sources of different color value.

But, if an observer makes a large number of different independent observations to obtain the transmission coefficient of a certain screen, he may consider the average to represent the best value which he would obtain for the given screen. If, further, this screen is similarly measured by a large number of different observers, the average of the averages of them all might well be considered as the value which would be obtained by a normal eye. The method, therefore, of using tinted glass color-screens offers a means of overcoming the two principal difficulties which arise in the photometry of light sources of different color.

It would manifestly be very expensive, if not impossible, for each person desiring to use such screens to calibrate them in the above manner. Such a calibration should be carried out at the National Bureau of Standards and a set of standard color-screens should be prepared in the manner outlined above. By virtue of its position, the Bureau, having prepared such a set of screens and made the local calibration, could then send them to different laboratories, both in this country and abroad, for calibration. It would then be possible to obtain international uniformity, which in conjunction with the proposed international agreement on a common candle-power unit would have far-reaching and most beneficial results.

This would result in a set of standard screens from which the Bureau could furnish certified copies to anyone desiring them. It is evident that their reproduction would not involve color errors and, therefore, if copies were used throughout the country there would result a uniformity in color photometry, and consequently in the rating of the present high-efficiency sources which would be very satisfactory.

It would be very interesting, if such a set of screens were thus calibrated at different laboratories throughout this country and Europe, to have them calibrated, also using a flicker photometer. This would give information as to the correctness of the assumption that the flicker photometer gives the true relation between light sources of different color.

It would seem that such screens could be used in all cases where it is desired to photometer light sources of different color, but the accuracy obtainable may not be the same in all cases. It is evident that for the highest accuracy the screens should be used under conditions as nearly as possible like those under which they were calibrated with a certain illumination falling upon them and with light of a certain color value, and the best results would be obtained if these conditions were duplicated in their use in practice.

Since, however, the conditions of use are by no means universally the same, it would be desirable for anyone needing such screens to determine first the conditions under which they are to be used and then specify similar conditions when requesting calibrations of the screens by the Bureau of Standards. In many factories, for instance, the sources under comparison, the test lamp on one side and the comparison on the other, are at a fixed distance from each other, the photometer being movable. Under these circumstances it is evident that unless a sectored disk is used, the illumination on the photometer screen will differ with the difference in intensity of the test lamps. In general, however, the limits of this illumination are known or may be fixed, and in this case it would be desirable to have the color-screen calibrated under two or more intensities of illumination representing the limits above mentioned. If these limits are too broad for the desired accuracy to permit of the use of a single value of the transmission coefficient, then the two values should be used.

If the type of photometer is such that it is not feasible to place the color-screen directly against the side of the photometer it may be placed adjacent to and at a fixed distance from the comparison lamp. Under such circumstances the request for calibration should give, in addition to the efficiency and the intensity of the comparison lamp, a statement as to the distance from the comparison lamp at which it will be used.

The method of using glass color-screens is equally applicable to the photometry of gas, but in this case the calibration of the screens might have to be modified.

The question may be raised as to whether in incandescent lamp photometry it would not be more desirable to standardize lamps of different specific consumption rather than to use the color-screens. There are advantages in this arangement, but there are also some disadvantages. In the first place, it would require a relatively large number of standards, for where one color screen would be used, several of the corresponding standard lamps would be desirable, as it is not safe to trust to a single standard. Furthermore, it would be necessary to change the comparison lamp and restandardize it for every lamp of different specific consumption photometered, and while this might not be objectionable in factories it might be very much so in testing laboratories. Again, the constancy of the high-efficiency lamps as standards has yet to be demonstrated.

Finally, while it is not claimed that the method of using tinted glass color-screens entirely eliminates the error in the photometry of light sources of different color, it would certainly seem feasible by this method to localize this error, if it can be called such. Moreover, there is no apparent reason why differences in the photometric comparison of light sources of different color should not be practically eliminated in the country at large, if not throughout the world, by the adoption of an arbitrary set of color values, through the use of color screens. We have, for the time being, adopted an arbitrary standard of light intensity, and why should we not adopt an arbitrary set of color values? Such action would make it possible to have uniformity in the photometry of light sources of different color value.

## The Rouge-Faget Permutator.

In a paper entitled "The Permutator," read before the Armour Institute of Technology branch of the American Institute of Electrical Engineers, Mr. F. C. Zanzig gave a description of the Rouge-Faget permutator or rectifier for changing alternating current to direct current. The machine was defined as a rectifier in the strict sense of the word, consisting of a transformer having a non-inductive rectifier. The transformer action takes place in a hollow cylindrical core having a primary and secondary circuit. The former has a winding similar in every respect to that of an induction motor stator. The latter, however, consists of chord circuits connected to the segments of a fixed commutator about which a set of brushes rotate. These chord circuits are so arranged that when carrying the rectified currents gathered by the synchronously rotating brushes, there is produced in the core the same distribution of ampere-turns as is produced by the primary circuit. Stated mathematically, the distribution furnished by the primary coils

is ($I \sin wt$); by the chord windings it is $I_1(N_1 \sin wt_1)$ where $N$ = number of primary turns; $N_1$ = number of secondary turns; $I$ = maximum value of alternating current, and $I_1$ = value of direct current. Thus the inductive action, which corresponds to equivalent transformer action, is balanced.

Within the hollow core a synchronous motor armature rotates about a vertical shaft and drives a set of brushes about the fixed commutator. It is excited by the rectified voltage. The rotating field in the core, having considerable leakage flux interlinked with the windings, furnishes sufficient torque to

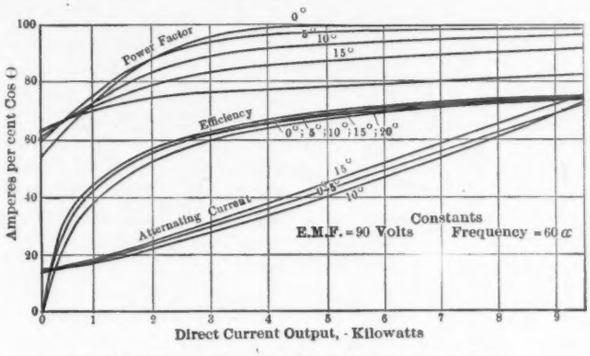



FIG. 1.—EFFECT PRODUCED BY VARYING BRUSH LEAD.

drive the light-moving members. This brush motor starts as an induction motor. At the instant the supply circuit is closed, an alternating current exists on the direct-current side of the machine having a frequency equal to the product of the line frequency, and a slip which decreases as the motor approaches synchronism. The impedance of the armature coils decreases, therefore, becoming negligible near synchronism. This allows sufficient current to circulate in the coils to cause the armature to fall into step with the rotating field and thus operate at

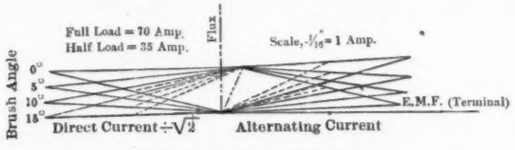



FIG. 2.—VECTOR DIAGRAM.

synchronous speed. The operation takes but a few seconds.

If it is desired to reverse the polarity of the brushes, it is only necessary to open the feeder switch for a few moments and again close it. If the desired result is not obtained, the process is repeated until the desired effect is produced. The brushes may be shifted relatively to the armature, thereby giving an adjustment of the commutating plane to suit conditions within the limits of sparkless operation. Because of the distributed chord circuits, sparkless commutation is obtained even with heavy overloads. The brushes when in the natural plane make contact with those segments of the commutator which are connected to the coils having the maximum induced voltage.

The curves given in Fig. 1 show the effect produced by varying the brush lead for any output. The angles given in this figure refer to the reading on a scale. For 10 deg. the brushes are in the neutral plane, for 5 deg. they lead by an angle of 10 electrical degrees, etc. The vector diagram, Fig. 2, shows vertically the results obtained by making the above adjustments. Thus it is seen, remembering this machine has an output of

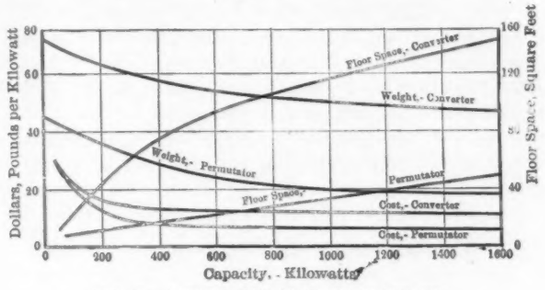



FIG. 3.—CHARACTERISTICS OF MACHINE.

only 9 kw, that the load characteristics compare favorably with a rotary converter—in fact, this is true for all sizes.

However, these results were obtained with a wave having an appreciable fifth harmonic; furthermore, since the excitation of the motor (machine self-excited) depends upon the rectified voltage, which in turn is a function of the brush position, it is evident that many peculiar phenomena may rise under abnormal conditions.

Mr. Zanzig brought out prominently the advantages this machine has over the converter. Some of these have already been mentioned. Briefly stated, the starting action is exceedingly simple and no starting apparatus is necessary. Synchronous speed is attained within a few seconds, and hunting is practically impossible. Hence it follows that the machine requires less attendance, and in fact can be operated remotely; if located in a substation, it can be controlled by the generating-station attendant. Further, transformers are unnecessary and the impressed voltage may have any value whatsoever, the rectified voltage being a function of the secondary voltage only. Since hunting is impossible, the machine may be operated in parallel without difficulty.

Fig. 3 gives some idea of the characteristics of the machine when compared with a converter in regard to weight, floor space and cost. It may be said that the customs duty (for the Rouge-Faget permutator is made in France) is not included in the cost of the permutator, but, on the other hand, the weight and floor space of the transformers which would have to be used with converters are not included. It is apparent that this machine can readily be placed upon an electric locomotive without the drawbacks of a converter under the same conditions.

# CENTRAL STATION

## MANAGEMENT, POLICIES AND COMMERCIAL METHODS

## Ethics in Salesmanship.

Mr. H. P. Albaugh, president of the Albaugh-Dover Company, of Chicago, a mail-order house, made an interesting address at the meeting of the Electric Club in Chicago on July 14, his subject being "Ethics in Salesmanship." The speaker said that salesmanship is a profession, and a noble one, too. It means taking hold of the minds of men and women and controlling them; there is no more important work in the world. The salesman has been accused of many things that are not true, or are true only to a limited extent or in relation to some unworthy members of the craft. Unlike love and war, all things are not fair in selling goods. Sharp, tricky methods sometimes result in a string of orders, and the conscientious man wonders if that plan is not after all the best. But sooner or later all nefarious methods will react on the perpetrator; the trickster is bound to fall by the wayside.

Considering the characteristics of real salesmanship, contrasted with the spurious kind to which he had alluded, Mr. Albaugh mentioned three essentials. The first is knowledge of one's self. Is the salesman fitted to carry the message of this company or that to the world? Efficiency should be built up on right lines. The successful salesman is not a copyist; he turns up things and does not wait for things to turn up. Every good salesman must originate methods. The second characteristic is enthusiasm. The man who sells goods must

have courage and faith. Lukewarm salesmen are worse than useless. The third essential enumerated by the speaker is an intangible, peculiar sort of ability which, for want of a better term, he called power of suggestion. This means the ability to cause men to follow the salesman's reasoning. There must be an appeal that will bring a response—an appeal no less worthy and dignified than that made by the preacher, the lecturer or the advocate at the bar.

## Residence Wiring in Chicago.

Since Dec. 1, 1907, the Commonwealth Edison Company of Chicago has wired 945 houses and apartments for electric service. This wiring represents an addition of 26,715 50-watt equivalents to the company's connected load. Consumers are given two years to pay the expense of wiring their premises, which is charged substantially at cost and spread over monthly payments.

## An Enterprising Colorado Hotel.

The Stanley, one of the leading summer hotels of Colorado, which has just opened its first season, employs electricity for all heating, cooking, and laundry work, of course, being lighted electrically. It has its own water-power plant with a total capacity of some 300 hp and with transmission at 6600 volts. The village of Estes Park and surrounding hotels are supplied from the same plant with their lighting. Mr. F. O. Stanley is the originator of this project.

## Reduction in Rates in Chicago.

In accordance with the provisions of its ordinance, the Commonwealth Edison Company, of Chicago, announces a reduction in rates, effective Aug. 1. On and after that date all lighting bills computed from meter readings will be made out at a net charge of 6 cents a kw-hour for the low-rate portion, allowing 1 cent per kw-hour for payment within 10 days. This is a reduction from 7 cents. The primary charge will remain as before. It is computed that the percentage of reduction on the average total bill will range from 5.3 per cent for two-hour-per-day users to 13.3 per cent for 24-hour-per-day users. The general average reduction is figured at 6½ per cent.

## Vacuum Cleaning at Paxton, Ill.

The Paxton Construction Company, which does electrical contracting in the city of Paxton, Ill., operates a vacuum cleaning outfit which was formerly taken from house to house in a wagon and operated with a gasoline engine. The gasoline engine gave trouble and occasionally stopped in the midst of operations, so that now the company uses a ¾-hp Wagner single-phase motor in place of the gasoline engine. A meter is carried on the wagon and the company being in very close relations with the Paxton Electric Company, which is the central-station company, is allowed to tap the 110-volt secondary distribution system at any point where it desires to operate the vacuum cleaning outfit.

## Rehabilitation of Public Utilities in Boone, Iowa.

At a meeting of the city council of Boone, Iowa, on July 8, a franchise was granted to Messrs. E. E. Hughes, J. H. McBride and Andrew Stevenson to operate an electric-light plant, heating plant and street-railway system in that city, subject to ratification by the citizens at a special election to be held on August 16. It is reported that the gentlemen named have already secured an option on the properties of the existing Boone Electric Company, of which Mr. John Reynolds is president, and that it is their intention to proceed at once to the rehabilitation of the public utilities of the city. It is also reported that further interurban railway extensions from Boone are in mind, the first objective point being Story City.

The rates provided in the ordinance are favorable to consumers. The schedule for electricity to use for power provides for rates ranging from 9 cents to 3 cents a kw-hour. Consumption of 40 kw-hours or less per month is charged at the 9-cent rate, and there is a series of reductions at the rate of 1 cent a kw-hour until the consumer taking 400 kw-hours or over per month pays only 3 cents per kw-hour. The rates for electricity for lighting range from 13 cents to 6 cents per kw-hour. Consumers taking 20 kw-hours or less per month pay the 13-cent rate, and those taking 160 kw-hours and over secure the 6-cent rate, with various intermediate steps between. A 10 per cent discount is allowed on both light and power rates if paid in 10 days. The minimun charge for power is $1 for the first horse-power and 50 cents for each additional horse-power, but no minimum charge for any consumer shall exceed $5 a month. The guarantees agree to furnish power and light in all parts of the city after November, 1910.

According to the system of rates established, each consumer is to pay for the entire quantity used by him at the rate his highest meter reading entitles him to receive. The further provision is included that in case a meter reading indicates a larger total debit than the next graduated quantity would produce, then the lower rate is to apply on the total bill.

In relation to street railways, the grantees have the right to the use of all streets for street car purposes, with a few exceptions. The fare shall be 5 cents, but 24 tickets shall be sold for $1. These tickets are good, however, only between the hours of 6 and 9 a. m. and 4 and 7 p. m. The charges for heating are not to exceed the present rate of 15 cents per foot of radiation annually. Street arc lights of 1200 cp are to be furnished on the moonlight schedule at $52.50 a year. In addition, tungsten incandescent lights are to be used in alleys.

## Combined Electric Light and Ice Plants.

Every year sees an increase in the number of artificial ice plants. Many of these are installed in connection with electric lighting and power stations. Artificial ice manufacture was at one time confined almost entirely to the Southern States, but is gradually creeping north, and at the present time many plants are being erected north of the latitude of St. Louis. As the demand for pure ice increases, the zone within which an artificial ice plant can thrive is likely to continue to move gradually north, as it has done for the past 10 years.

In the smaller towns there are in many cases excellent reasons, based on economy, for the operation of electric lighting and ice manufacturing plants together. At the risk of wearying those central-station managers who have been operating ice plants in connection with their central stations for years we will point out some of the fundamental requirements of ice manufacture and the reasons why it fits in so well with central-station operation as conducted in the smaller towns.

A small artificial ice plant first of all requires a sufficient amount of distilled water to supply the tonnage of ice manufactured per day, as the air bubbles in "raw-water" ice are objected to by many classes of buyers. In the case of an independently operated ice plant this distilled water is supplied from the condensed exhaust of the engines which drive the ammonia compressor and pumps. In the case of a small plant equipped with uneconomical engines, this condensed engine exhaust in ordinary practice is about equal to the amount of distilled water required for making ice. In the case of an ice plant operated in connection with an electric light and power plant, which operates 24 hours per day, the exhaust already available from the electric light and power engines will in many cases be sufficient to furnish the necessary water for ice manufacture. In many cases of combined plants, however,

use has not been made of this exhaust, but an independent steam-driven compressor for the ice plant has been installed. In such cases the advantages of combining the ice and central-station business are the saving of a separate set of boilers for the ice plant, the saving of some fixed boiler losses, and the saving of a set of separate engineers and firemen. These savings are important. There is in many cases a chance to make an even more economical combination by driving the ammonia compressors and other pumps of the ice plant by electric motors. If the exhaust from the engines (on account of the other load carried) is more than sufficient to supply distilled water for ice making, the exhaust from a separate engine-driven compressor is not needed and the use of motor-driven pumps is usually more economical because the power supplying them is generated by larger and more economical engines than those with which the independent steam-driven compressor would be supplied. Under the conditions prevailing in many small plants, the addition of the load imposed by the ice plant motors will cause a relatively small addition to the daily coal consumption and will not increase the necessary investment in generating capacity because ice is manufactured only during the summer, and the lighting peak is usually in the winter.

Another ice and electric lighting plant combination is the use of an absorption system of refrigeration in place of the more commonly used compression system. With the absorption system a good-sized ice plant can be operated from the exhaust steam of a small electric lighting plant, by maintaining a small back pressure on the engines. The exhaust steam is used in the ammonia boiler, which takes the place of the compressor used with the ammonia compression system. As regards the use of power or steam, the absorption system is more economical than the compression system. The first cost of the installation, however, conditions being similar in the two cases, is about 25 per cent more than for a compression system and about double the amount of condensing water is required. If all the exhaust steam be used in the ammonia boiler, more ice can be made than there is distilled water to supply. This suggests making some of the ice of undistilled water and selling it at a lower price.

A good supply of cooling or condensing water is necessary in ice manufacture, as the exhaust of the engine must be condensed and cooled and the compressed ammonia must also be cooled. An ice plant with a capacity of 15 tons of ice per day, such as would be installed in many small towns, requires about 960 gal. of cooling water per hour under average conditions.

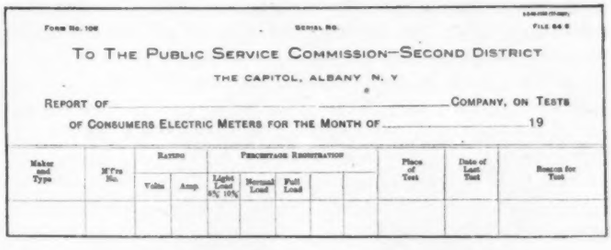
To sum up, the economy of combining ice with electric light and power manufacture consists, in the small station, of (1) the saving in duplicate crews of engineers and firemen, (2) a saving in boiler, stack and boiler-house investment, (3) the saving of boiler losses caused by the operation of two boiler plants where one would suffice, and (4) the saving due to the utilization of exhaust steam now going to waste from the electric-lighting engines. These savings in the aggregate should amount to a considerable portion of the operating cost of ice manufacturing. The figures obtainable from some combination ice and central-station plants as to the investment and income from operation indicate that the combination of these industries has a very gratifying effect on the net earnings of both, so that the net earnings on the total investment are considerably better than with a central-station property alone. If a small central station with plenty of exhaust steam is so situated that it can utilize its exhaust steam for ice making in the summer and for steam heating in the winter, it is disposing of its by-products to the best advantage.

## Results of Meter Tests.

The accompanying table gives data compiled from the meter-testing reports of companies which are under the jurisdiction of the Public Service Commission of the Second District of New York State. The information is furnished to the commission on a form of which a reproduction of the head is given herewith.

The data cover a period of nine months, from August, 1908, to April, 1909. As will be seen, induction and commutator types of meters are separately reported on, and the tests are classified as to place of test (station or premises) and as to whether the tests were initial, made on complaint or in regular order. As against 24.8 per cent of meters running too slow and therefore entailing loss to the central station, 10.4 per cent registered fast. Moreover, no less than 1087 meters were found not to register at all on one or more load points.

| Date | Induction Type Meters | | | | | | Commutator Type Meters | | | | | | 4% or More Slow on Either Light or Full Load or Both | | 4% or More Fast on Either Light or Full Load or Both | | Tested at Plant | Tested on Premises | Regular Tests | Initial Tests | Complaint Tests | Total Meters Tested | Found Not Registering | Companies Reporting Tests | Companies Reporting No Tests Made |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light Load (5–10% Capacity) | | | Full Load (100% Capacity) | | | Light Load (5–10% Capacity) | | | Full Load (100% Capacity) | | | | | | | | | | | | | | |
| | 0–96 | 96–104 | 104+ | 0–96 | 96–104 | 104+ | 0.96 | 96–104 | 104+ | 0–96 | 96–104 | 104+ | No. Slow | % of Total Slow | No. Fast | % of Total Fast | | | | | | | | |
| Aug., 1908 | 495 | 3,210 | 195 | 151 | 3,441 | 148 | 1,077 | 638 | 206 | 217 | 1,503 | 200 | 1,605 | 27.6 | 616 | 10.6 | 1,421 | 4,473 | 3,934 | 1,039 | 921 | 5,894 | 159 | 84 | 106 |
| Sept., 1908 | 554 | 3,460 | 156 | 165 | 3,854 | 151 | 1,103 | 650 | 196 | 243 | 1,489 | 217 | 1,642 | 26.8 | 565 | 9.2 | 1,869 | 4,250 | 4,751 | 1,225 | 143 | 6,119 | 158 | 98 | 83 |
| Oct., 1908 | 444 | 3,305 | 147 | 175 | 3,639 | 82 | 1,575 | 1,058 | 342 | 457 | 2,157 | 301 | 1,996 | 29.3 | 712 | 10.5 | 2,138 | 4,673 | 4,937 | 1,593 | 281 | 6,811 | 128 | 100 | 83 |
| Nov., 1908 | 432 | 2,979 | 146 | 174 | 3,288 | 87 | 1,307 | 1,032 | 448 | 431 | 2,057 | 299 | 1,802 | 28.4 | 782 | 12.3 | 2,066 | 4,278 | 4,606 | 1,358 | 380 | 6,344 | 181 | 108 | 80 |
| Dec., 1908 | 524 | 3,540 | 208 | 181 | 3,942 | 141 | 1,153 | 746 | 354 | 365 | 1,669 | 221 | 1,730 | 26.4 | 749 | 11.3 | 2,115 | 4,437 | 4,607 | 1,406 | 539 | 6,552 | 131 | 121 | 68 |
| Jan., 1909 | 399 | 3,515 | 277 | 113 | 3,992 | 133 | 933 | 745 | 330 | 276 | 1,574 | 169 | 1,369 | 22 | 756 | 12 | 1,759 | 4,507 | 4,033 | 1,617 | 616 | 6,266 | 98 | 125 | 74 |
| Feb., 1909 | 516 | 3,552 | 225 | 145 | 4,038 | 168 | 881 | 841 | 295 | 263 | 1,627 | 143 | 1,471 | 23 | 661 | 10.3 | 1,692 | 4,714 | 4,592 | 1,305 | 509 | 6,406 | 80 | 112 | 81 |
| March, 1909 | 669 | 4,279 | 292 | 214 | 4,833 | 177 | 830 | 900 | 265 | 250 | 1,567 | 136 | 1,539 | 21 | 703 | 9.6 | 2,497 | 4,808 | 5,260 | 1,703 | 342 | 7,305 | 80 | 122 | 72 |
| April, 1909 | 576 | 4,571 | 219 | 164 | 5,076 | 182 | 836 | 782 | 208 | 198 | 1,456 | 122 | 1,461 | 20.1 | 612 | 8.4 | 2,257 | 4,998 | 5 665 | 1,395 | 195 | 7,255 | 72 | 109 | 86 |
| Totals..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14,615 | ..... | 6156 | ..... | 17.814 | 41,138 | 42.385 | 12,641 | 3,926 | 58,952 | 1,087 | ..... | ..... |
| Averages... | 512 | 3,601 | 207 | 165 | 4,011 | 141 | 1,077 | 821 | 294 | 300 | 1,678 | 201 | ..... | 24.8 | ..... | 10.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |



Form No. 106 Serial No. File 64 B

TO THE PUBLIC SERVICE COMMISSION—SECOND DISTRICT

THE CAPITOL, ALBANY N. Y.

REPORT OF _____ COMPANY, ON TESTS

OF CONSUMERS ELECTRIC METERS FOR THE MONTH OF _____ 19

| Maker and Type | M'f'rs No. | Rating | | Percentage Registration | | | | | Place of Test | Date of Last Test | Reason for Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Volts | Amp. | Light Load 5% 10% | Normal Load | Full Load | | | | | |
| | | | | | | | | | | | |

FORM FOR REPORTS OF METER TESTS.

# INTERIOR WIRING AND ILLUMINATION

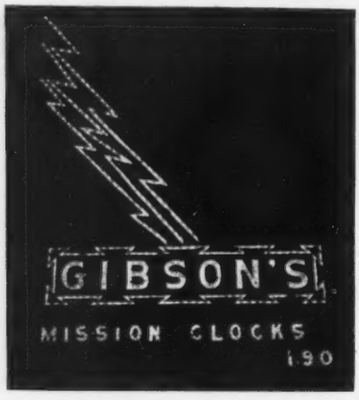
## Special Lighting at Waukegan, Ill.

One feature of the recent "home-coming" celebration in Waukegan, Ill., was a special illumination of the streets by festoons of incandescent lamps erected and operated by the North Shore Electric Company. Festoons of light to the number of 15 were strung for a distance of three blocks along the principal street of the city. Each festoon contained 100 lights. The central-station company donated the electricity used in this special street lighting attraction, charging only for the

work of making the installation. The merchants were greatly pleased with the brilliant effect, and have now under consideration the organization of an association to maintain permanently the special decorative street lighting on the principal streets.

## Electric Sign in Memphis, Tenn.

The accompanying illustration shows an electric sign recently installed by the Merchants' Power Company, of Memphis, Tenn. The sign is designed to produce a lightning effect and has attached to it a smaller sign, which is changed every week, advertising different sales, novelties, etc. The lightning




ELECTRIC SIGN IN MEMPHIS.

flashes encircle the entire sign, after which the word "Gibson's" appears and then the attraction. The sign extends from the roof of the building across the sidewalk, and has a double face. It burns every night from dusk until midnight, and is connected on a flat-rate basis.

## Baseball by Electric Light.

Considerable interest the country over has naturally been manifested in the widely heralded baseball game by electric light, which was played under the auspices of the Grand Rapids Advertisers' Club on the night of July 7 at Grand Rapids Mich. The game was promoted by the club primarily as a means of raising money by attracting a large crowd, and as such was a great success. Forty-five hundred people were present—the largest audience ever seen on the Ramona Park baseball grounds, where the game was played. From the standpoint of the baseball game itself the illumination could hardly be called a success. The players seemed to be afraid to throw a swift ball, although several long flies were caught as far out as the center field.

The problem of illuminating such a field as this is, of course a tremendously difficult one, because of the great height to which balls sometimes go. Unless the illumination is such that the ball can be seen high in the air without the blinding effect of the lamps in line with the ball, baseball playing by artificial light can never be held a success. In the opinion of Mr. H. W. Hillman, sales manager of the Grand Rapids-Muskegon Power Company, the engineers of which company installed the electric lighting on the field, it may be possible some day to play a successful professional baseball game by artificial illumination. He considers three points are essential: First it will require an ample appropriation so as not to be hampered by lack of funds; second, it will require the services of an illuminating engineer to devote considerable attention to the matter in conjunction with those who have been through the experience of this first game and who understands the necessary improvements which could be made. He appreciates that it is a difficult piece of illuminating engineering which will require time and experience and then will be subject to improvements from time to time.

The baseball field for this game was illuminated by 40 lamps, 28 of which were flaming arcs hung high over the field. Two flood lights, following theater practice, were stationed at the ends of the main grandstands. There were 10 searchlights with which an attempt was made to illuminate the upper regions, but with little success. It is interesting to learn the results of this attempt, as it is only upon experimental knowledge gained in this way that future improvements, which may make artificial lighting of this kind successful, can be evolved. On the whole, the illumination must have been rather good for a first attempt, as the score of the seven-innings game was 11 to 10, with 20 hits and 2 errors on one side and 19 hits and 2 errors on the other side.

One spectacular and impressive feature of the evening's program was the sudden turning off of all the flaming-arc lamps and the concentration of the searchlights on "Old Glory" flying in the breeze on the field. At that instant a band struck up the "Star-Spangled Banner." The effect was exhilarating and inspiring and in an instant forced the thousands to their feet to take up the refrain.

## Electric Lamps for Automobiles.

By Martin P. Rice.

Electric lamps have two important advantages for automobile lights which ought to insure their universal adoption. The first is safety, and the second is convenience. The increased speed of gasolene-driven vehicles under conditions and upon roads designed for horse traffic involves a sufficient element of danger without introducing the risk of fire from oil or gas lamps. While not perhaps so vitally important as safety, convenience is an advantage not less appreciated by all users of automobiles. Stopping to light up is sometimes annoying, particularly on a windy night, and the regulation of generators, gas tanks, or oil wicks is usually more or less of a nuisance.

All this is avoided by using electric lamps. They eliminate flame and inflammable material. They are lighted and extinguished instantly by a switch within easy reach of the driver. For cleanliness, they are unsurpassed. They produce no soot or smell, and there is no oil to leak or collect dust. There is practically no heat, so that the silvered mirrors cannot be damaged. The interior surfaces of lanterns fitted with electric lamps stay bright and clean. The electric system involves no difficulty in summer or winter—in fact, it is ideal for automobiles.

### LAMPS.

The success of the system depends, however, upon the selection of suitable lamps and batteries and upon installing them properly. Carbon-filament lamps, because of their low efficiency,

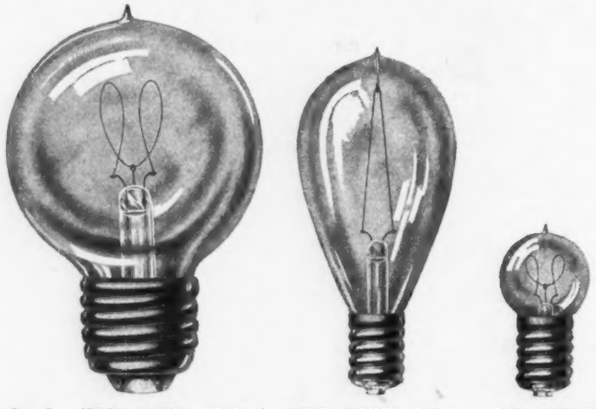


FIG. 1.—HEAD LIGHT. FIG. 2.—SIDE LIGHT. FIG. 3.—TAIL LIGHT.

would require a battery of almost prohibitive size and weight, but tungsten lamps can be operated from batteries of reasonable weight and dimensions.

The filaments of these lamps for low voltages are short and strong enough to resist the jar and vibration incident to auto-

mobile service. No special spring support is necessary and regular sockets can be used. Usually 6-volt lamps are employed, because this is the common voltage of ignition batteries, but 8-volt or 4-volt lamps may be used if preferred. The following equipment of tungsten lamps has been found suitable for a touring car or runabout designed for town and country use: Headlights, two 10 cp to 20 cp; side lights, two 2 cp or 4 cp; tail light, one 2 cp.

The filaments of headlights must be of compact form so

FIG. 4.—ADAPTER FOR CHANGING FROM KEROSENE TO ELECTRICITY.

that the light is concentrated practically at a point which may be adjusted to the focus of the mirrors. If the filament is not compact, light is wasted by scattering. Several leading manufacturers of automobile lamps are now making brass lamps with reflectors and sockets adapted to electricity, but usually they are designed for lamps with miniature base (diameter, 3/8 in.; length, 1/2 in.), which are entirely unsuitable. The headlights should be fitted with standard Edison screw bases (diameter, 1 in.) and the side and tail lamps with candelabra bases (diameter, 7/16 in.; length 5/8 in.). Some headlights originally designed for acetylene can be modified for electricity.

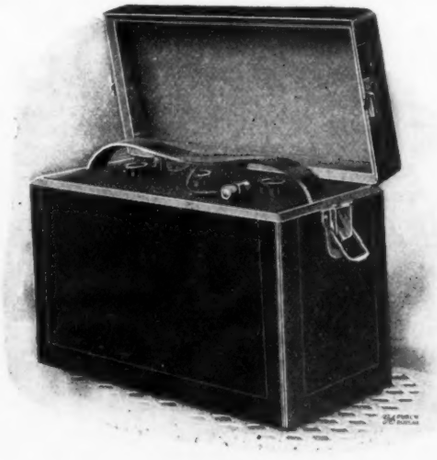


FIG. 5.—BATTERY FOR LIGHTING AND IGNITION.

but great care must be taken to adjust the position of the electric lamp so that a suitable beam of light will be reflected upon the road. A slight change in the position will make a remarkable difference.

Side and tail lamps designed for electricity may be much simpler in form and construction than lamps for kerosene, and while the latter may be adapted to electricity they include unnecessary parts, such as burner and oil reservoir.

BATTERY.

Tungsten automobile lamps will have satisfactory life at an efficiency of 1 watt per candle. On this basis, the required battery capacity may be readily calculated. Two 16-cp headlights, two 2-cp side lights, and one 2-cp tail light require about 38 watts; or, with a 6-volt battery, the current will be about 6.3 amp. A 100-amp-hour battery will supply all these lamps continuously for 15 hours without recharging. The lamps are so readily turned on or off that motorists will generally not use the headlights except outside of town, and the side lamps can then be extinguished. The number of hours of service with one charge will thus be considerably prolonged.

The battery is also available for engine ignition. It may be

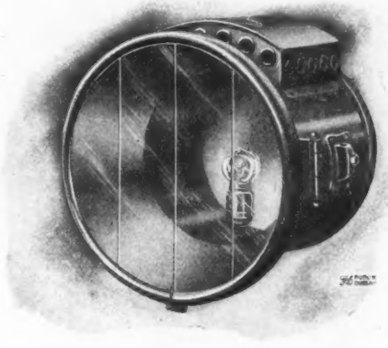


FIG. 6.—HEADLIGHT.

recharged on any direct-current system, or from an alternating-current system with a mercury rectifier, or any device used for charging ignition batteries.

An electric system of automobile lighting requires much less weight in battery than is commonly supposed. A 100-amp-hour battery weighs 55½ lb., but it replaces the ignition batteries weighing probably 25 lb., and a gas tank weighing 30 lb.

WIRING.

The lamps should be connected on three separate circuits, one including the two headlights, another the two side lamps, and the third the tail light. This arrangement permits the use of headlights and tail light for touring where the side lamps are not required, and in the city the side lights and tail lamp can be used without the headlights. The wire must be heavy enough to carry the current without appreciable drop in voltage and should be connected to the battery through a suitable fuse. Wiremen are liable to overlook the fact that low-voltage lamps are very sensitive to a drop which would be entirely permissible

FIG. 7.—SIDE LIGHT.

FIG. 8.—TAIL LIGHT.

with 110-volt lamps. The battery leads and wires leading to the headlights should have a cross-section of not less than 10,000 circ. mils (No. 10). The wire for side lights and tail lamp may be smaller, say, 4000 circ. mils (No. 14). Flexible wire should be used, and on expensive cars it may be enclosed in brass piping so as to eliminate entirely any possibility of damage from short-circuits. A short length of rubber tubing should be used, however, to connect the brass pipe with the headlights, as otherwise the vibration may cause trouble. If a car is carefully wired with well insulated wire it will be perfectly safe without the brass piping, which, of course, adds considerably to the expense. As previously stated, the headlights should be

fitted with standard Edison screw sockets (diameter, 1 in.) and the side and tail lamps with candelabra sockets (diameter, 7/16 in.). The miniature sockets (taking a base 3/8 in. diameter) frequently used for this purpose are entirely too small to carry the current and withstand the vibration. The switch must be adapted for at least three separate circuits and it should be conveniently located on the dash within reach of the driver. Additional circuits are a convenience for a small lamp over the

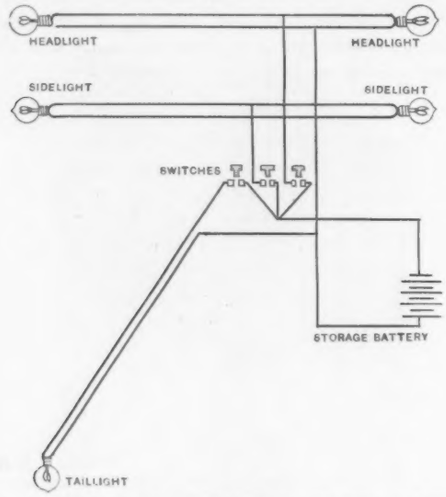



FIG. 9.—DIAGRAM OF AUTOMOBILE LIGHTING CIRCUITS.

speedometer, a portable trouble lamp (4 cp), and a lamp of about 2 cp conveniently located for the inspection of maps or road books. Switches of the type shown in the illustration are made up for various circuits from one to four.

COST.

The cost of equipping a car with electric lamps depends, of course, upon the material selected and the charges of the wireman employed. The following will serve as a rough approximation:

| | |
|---|---|
| One 100 amp-hour, 6-volt battery | $35.00 |
| One battery box for running board | 5.00 |
| Two 16-cp, 6-volt tungsten lamps | 1.00 |
| Three 2-cp, 6-volt tungsten lamps | 1.50 |
| One 3 or 4-circuit switch | 1.50 |
| 50-ft. twin conductor | 2.50 |
| Wireman's time | 3.00 |
| Total | $49.50 |

The cost of brass lamps has not been included in the estimate because it is substantially the same as for gas and oil lamps. The cost of two standard and three candelabra sockets, which will be required if gas or oil lamps are modified for electricity, is about $1.50.

SUPERIORITY.

The small 2-cp tungsten side and tail lamps will give a brilliant light never seen in kerosene lamps even when new; and as there is no soot or heat to damage the glass and reflecting

FIG. 10.—FOUR-CIRCUIT SWITCH.

surfaces, and no deterioration, the brilliancy will be permanent. Electric lamps cannot blow out. The 20-cp tungsten headlights, when properly adjusted with reference to the mirror, will fully equal the best acetylene lamps.

For safety and convenience, electric automobile lamps are unsurpassed and will speedily be included by manufacturers as part of the standard equipment of all high-grade cars. They are equally advantageous for motor-boat lighting.

## Newark Merchants Light Market Street with Flaming Arcs.

By William H. Stuart.

While 150,000 expectant people surged through Market Street at 8 o'clock in the evening of July 14, Mayor Jacob Haussling turned on the switch and transformed the thoroughfare into what may well be considered the most brilliantly lighted street in the world.

As described in the columns of the *Electrical World* of May 27, 1909, the merchants of Market Street, banded together in the Market Street Business Men's Improvement Association, have erected 58 double flaming-arc lamps of 9000 cp each, which extend along Market Street from the Pennsylvania Railroad Station to the Court House, a distance of three-quarters of a mile. This equipment was augmented by strings of incandescent lamps placed at close intervals along the street. The merchants added to the display with large electric signs and illuminated their buildings with outline incandescent lighting. It is estimated that the entire equipment easily reached a total of 2,000,000 cp.

In one window on Market Street an enterprising storekeeper had a novel display. Standing alone was a lighted candle. Beside it was placed a sign reading: "One candle-power." The dim, pale light thrown from the candle was useful as a means of comparison and created considerable attention from the spectators.

The scene at the turning on of the lights was spectacular. At 7:30 p. m. the regular electric signs, which are placed on the front of the Market Street buildings—and it might be added that there are as many of them as on any other street in the country for a similar distance—burst into brilliance. Then the extra outline incandescent lighting on the big buildings sent forth their glow. One large department store had a mammoth shield made up of strings of vari-colored lamps. A few minutes later and the street incandescent circuits were turned on. Finally came the big display, when the 58 flaming-arc lamps were started burning. At this point the merchants set off colored fire and fireworks, and many lighted paper balloons were sent up from the roofs of the buildings.

After the display was started the Merchants' Association held open house at their headquarters. The work, hopes and aims of the association were briefly told by Mayor Haussling, former Mayor W. H. Fiedler, Board of Works Commissioner, and also the chairman of the lighting committee of the city, Mr. Geo. H. Lambert, Mr. W. J. Wakefield, Jr., the president of the association, and other prominent citizens.

Newark has secured widespread notice from this form of street lighting. A number of Western cities have sent committees to inquire into Newark's street lighting, and locally it has not only well advertised that section of the city, but has increased trade fully 25 per cent since the time the illumination has been started.

Mr. W. J. Wakefield, Jr., the president of the Market Street Business Men's Improvement Association, said: "We really had to do something in the way of electric display, since South Broad Street was illuminated by flaming arcs last winter, or be left in the dark figuratively and actually. After our association was formed we worked hard and faithfully to brighten the street and in a few months' time had our scheme in actual operation. Newark has never seen such a demonstration as occurred when our lights were turned on. We had most all of Newark out to see it. Trade conditions have answered wonderfully under the stimulation of this lighting. Every merchant along Market Street is well pleased and encouraged as a result of this undertaking."

North Broad Street will in a short time install a flaming-arc lamp equipment, and the citizens are already talking of the wonderful "Great White Cross." Broad Street crosses Market, and when the plans are put into effect there will be about a mile of flaming-arc lamp lighting on Broad Street and three-quarters of a mile on Market Street, forming a large cross.

## New Telephone Patents.

REPEATER DEVICE.

As the repeater problem is largely one of mechanical arrangement and efficiency, inventors are striving to bring out better and more efficient mechanical relation of the repeater parts. A patent granted to Mr. H. R. Stuart, of Wheeling, W. Va., shows, in Fig. 1, a sectional view of the repeating instrument.

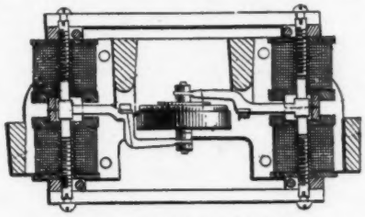


FIG. 1.—STUART MICROPHONE.

Both electrodes of the transmitting element are movable, each attached to a lever the far end of which carries a cylindrical armature. The coils are connected up to have the proper co-active relation.

NEW CIRCUIT ARRANGEMENTS.

In intercommunicating systems of the common-battery type, where the hook switches at the stations entirely control the completion of the battery current circuits, there is a chance for a waste of current and the running down of the battery. To obviate this Mr. W. A. Fricke, of Chicago, Ill., has devised a circuit wherein the home switch at one station in its actuated position must co-operate with the home switch of the connected station in its normal position, before the battery-supply circuit connected. The patent for this system is assigned to the Monarch Telephone Manufacturing Company.

For such long multi-station lines as are used for railroad despatch lines, where the receiving station, so to speak, is always at one end, there is some advantage in regulating all stations, no matter how remote, to the same transmitting volume. To this end he arranges a shunt circuit at each station, adjusted to correspond to its distance. A push button serves to connect the shunt during the transmitting period and thus send a corresponding output of voice current to the receiving despatch station. The transmitter batteries may be correspondingly graded and the receiving efficiency of the stations varied by including graded series condensers in the receiver circuits.

GENERATOR FOR COMMON BATTERY CURRENT SUPPLY.

It has always been found necessary to use a storage battery in connection with the current supply for a common battery telephone system, as such a low resistance shunt is necessary in order to absorb the commutator fluctuations of the usual direct-current generator. The unipolar generator has often been suggested as a solution of the problem of direct supply, but thus far there has been no commercial use of the unipolar machine for telephone working; however, inventors are still working on the problem. Mr. J. L. Hall, of Schenectady, N. Y., has recently patented a unipolar machine for this particular purpose, which carries enough of the field-cutting conductors connected in series to generate the desired potential. A commutator is suggested for the shaft of the machine to generate signaling current also. Mr. Hall has assigned his patent to the General Electric Company. A sketch showing the arrangement he has in view is shown in Fig. 2.

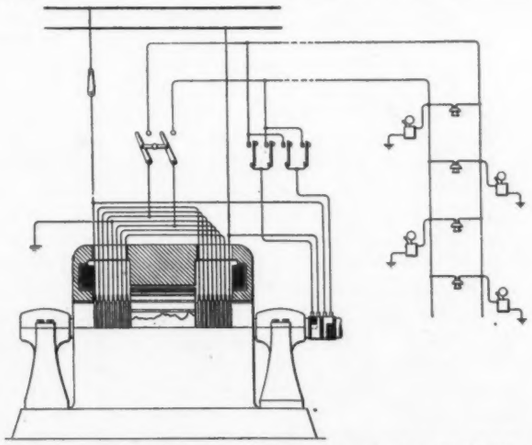


FIG. 2.—HALL SUPPLY SYSTEM FOR TELEPHONE CIRCUITS.

MISCELLANEOUS.

Some time ago we noted a patent covering an enclosing case for a portable telephone which was sound-proof. The face of the user closes an opening in the case when his mouth confronts the transmitter mouthpiece, the edge of the aperture being faced with a cushion. Two patents have been recently issued for improvements, both assigned to the Miniature Telephone Booth Company, of New York. One of these, granted to Mr. O. H. Goodrich, of Castleton Corners, N. Y., describes an adjustable linkage, connecting the hook support outside, the box, with the hook switch of the telephone set within. The adjustment provides for varying styles of telephone instruments. The second patent, granted jointly to Messrs. E. F. Hutton and G. A. Ellis, provides an impervious lining inside a felt lining so as to provide means for disinfection. One side is removable so that the instrument may be readily removed for repairs.

As a means of protection, Mr. M. Bowman, of McHenry, Md., has invented a disconnecting device for mounting upon the house wall, which consists of a box-like frame, to terminals upon which the instrument wires are led. The line wires are connected to terminals upon a slide piece, which slides in a vertical plane upon guides attached to the box frame. When this slide is pulled up the line terminals engage spring terminals attached to the box terminals. A rope within the building suffices to raise or lower this slide.

# LETTERS TO THE EDITORS.

## Value of Classics in Engineering Education.

*To the Editors of Electrical World:*

SIRS:—I have read with considerable interest Dr. Steinmetz's paper on "The Value of Classics in Engineering Education," and like so many of Dr. Steinmetz's writings, it is certainly a most concise statement of the arguments usually used in favor of requiring students in our colleges to study the ancient languages. There are a few points brought out in his paper, however, which to one not wholly unacquainted with the classics seem open to argument and even doubt.

Dr. Steinmetz states that "the introduction to other branches of human thought are best and quickest given by the study of the classics." It seems to me that an acquaintance with "the world of art and literature of ancient Hellas" can be acquired as advantageously, and certainly more quickly, through translations than through the laborious work required to "dig" it out of the original. I am not denying the value of the discipline acquired by the hard study required to master the 1500 more or less different forms of the Greek verb. That is another phase of the question. The history of the ancient civilizations, their social and political organizations can undoubtedly be acquired through other channels than the ability to read the original.

I am also of the opinion that the utilitarian value of the classics is considerably overrated by Dr. Steinmetz. If the student has had the proper training in English, which should include a good course in etymology, he will be able to get at the fundamental meaning of scientific terms. If very few of "the college students retain even a rudiment of their knowledge of modern languages," of classics the engineering student, I am afraid, would retain nothing.

My main objection to Dr. Steinmetz's advocacy is the enormous waste of time required to acquire an appreciative reading knowledge of the classics in the original.

The most serious objection to the merit of any discussion concerning the relative values of college studies lies in the fact that everyone seems to discuss the question from the viewpoint which has been determined by his early training. Because men

who have been trained in the classics have become eminent in various fields of endeavor does not seem to me conclusive that everyone should follow the same route. Perhaps it will be advisable for us to revise our conception of a liberal education.

Madison, Wis. C. M. Jansky.

## Photometric Comparisons.

*To the Editors of Electrical World:*

Sirs:—In your issue of July 1, on page 53, there is given a cut with a short article, entitled "Device for Photometric Comparisons." Inasmuch as the method therein described is extremely limited in its application and may, in the hands of the untrained, lead to serious mistakes, I would call your attention to the following:

The use of the method as described is limited to one angle, and one only, providing the position and the height of the lamps and reflectors are fixed, as is shown in the illustration. It is evident that the box could not be moved nearer one lamp than the other, and, consequently, the method is correct for only one position. Inasmuch as any photometric device is apt to be extremely misleading when shown for one angle only, it is evident that such a device must be used only with the utmost care, and cannot be used in showing respective merits of two reflectors for the reason that as a rule the value of any reflector is not confined to the light in any one angle, but has to be considered over a considerable range. Moreover, it is evident that the use of such a device would be applicable only with certain types of reflectors. If, for example, a strong concentrated light were wanted directly underneath, as is common practice in window lighting, and the customer were to judge of the effect by any such method as this, he would in all probability get a reflector giving a broad distribution of light, which would be entirely unsuited for this work.

It is, therefore, easy to see that such a method, while applicable for one special angle, is apt to be extremely misleading when shown to a non-technical observer, and should therefore be used with the utmost caution.

New York. V. R. Lansingh.

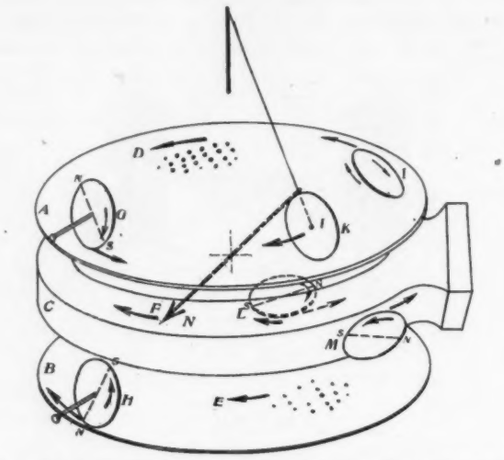
## Movement of Magnetic Material in a Rotating Field.

*To the Editors of Electrical World:*

Sirs:—The following notes relating to observations made by the writer and Messrs. Lénárt and Pfaff serve to draw attention to a peculiar phenomenon of the magnetic field and include an outline of an explanation therefor.

Two plates, *A* and *B*, of non-magnetic material, were placed at some distance above and below the stator (primary) of a polyphase induction motor, the rotor of which had been removed. The front faces of the stator and both of the plates were in horizontal planes. When very fine iron filings of uniform shape were placed on each of the plates and the primary circuit of the motor was closed, it was found that the filings on one plate moved in one direction while those on the other moved in the opposite direction. An exploring magnetic needle *F* showed that the filings on the lower plate *E* moved with the rotating magnetic field, whereas those on the upper plate *D* turned in a direction opposite to the field.

The facts observed are attributable to the circular motion around their center of mass into which the iron filings are thrown by the rotating magnetic field; the approaching field produces in the filings poles of opposite sign and the reciprocal action causes them to turn over. In confirmation of this explanation, an iron button free to revolve around a pin at its center was placed first on the upper plate and then on the lower, at *G* and *H*, respectively. In each case the button assumed a rotating motion, the direction being as indicated in the illustration. When the pin was removed from the button and it was allowed to move freely, a rolling motion was produced, as shown at *I*, the movement being in the direction of the rotating magnetic field when the button was on the lower plate, and in the opposite direction when it was on the upper plate. When the button was suspended from a thread the upper end of which was fixed in the axis of the stator bore, the button




MOVEMENT OF MAGNETIC MATERIAL IN A ROTATING FIELD.

traveled with the rotating field—that is, it moved in a direction opposite to that in which it rolled along the upper plate.

When iron filings were placed directly upon the body of the stator, at either the flat surface *L* or the cylindrical surface *M*, they rotated in a direction opposite to the revolving magnetic field, on account of the rolling motion.

The above-described experiments show that the direction of movement of a revolving magnetic field may be incorrectly judged when iron filings are employed. The only proper method for ascertaining the direction of motion is by means of an exploring magnet placed in or near the center of the stator bore.

Selmeczbánya, Hungary. Gera Boleman.

## Location of Vessels by Wireless Telegraphy.

*To the Editors of Electrical World:*

Sirs:—I was much pleased to read the letter of Mr. L. Espenscheid in your issue of May 13, as it gives me an occasion to make a comparison between the "multi-aerial radiogometer" of Messrs. Bellini and Tosi and my own.

I willingly admit the superiority of the "radiogometer" where

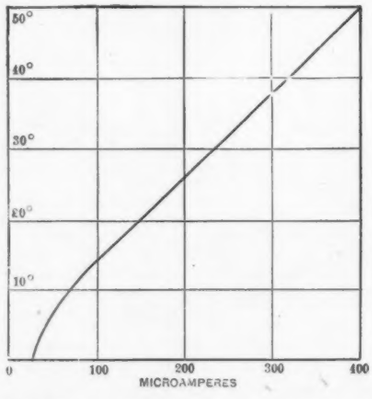



FIG. 1.—THROW OF INSTRUMENT FOR VARIOUS CURRENTS.

it can be properly applied, and especially when, instead of employing the telephone receiver a barretter-set is used. The telephone receiver is not suitable for any measurements of the kind, and its use by unskilful operators on the high seas, espe-

cially in time of excitement, is impracticable, even in the absence of fog whistles, which hinder all kinds of null methods depending on audibility.

The objections raised by Mr. Espenscheid may be met as follows:

First, the exact measurement requires only the reading of the deflections of the microammeter (pointer galvanometer). This can be done by the crudest operator working near the strongest fog whistle. The whistles do not disturb the deflections; this statement cannot be made of the human ear, which is generally employed with a radiogometer. The reading of the deflections is objective; it can be done by many persons at the same time, so that there is no hallucination, as may be the case when the ear is depended upon.

Second, although the barretter-set measures weak signals, as the curve of Fig. 1 shows, yet it is not delicate, as may be judged from Fig. 2, which shows a portable military set.

Third, the incoming signals really vary in strength, but this fact hinders only the null method of measurement by which the finding of the null point requires from 10 to 20 times as much time as does the reading of the deflection of the microammeter. If 20 readings are taken of the microammeter probably the average will be a good one. The more readings, the better the results. However, one can see at once whether

FIG. 2.—PORTABLE WIRELESS SET.

a reading is extraordinarily devious, and in this case the value will not be applied, and the measurement will be repeated.

Fourth, the interfering signals can be seen also. For instance, when the imperiled ship sends 200 microamperes in the letter *t* and if one receives also the signals of a rescuing ship, say, the letter *i* with 100 microamperes in the first second, the microammeter shows 300, the next second only 200, the third perhaps again 300 microamperes and so on, as the dashes and dots interfere with the ground signals of *t*. The pointer follows momentarily the increase of current strength, and hence, after some experience, the observer cannot be misled by interfering signals. Naturally, it is more convenient to operate when interfering signals are not present, especially from the point of view of the null methods with slower working, since the "radiogometer" cannot be used if waves are emitted simultaneously from several different vessels.

I believe that the chief difficulty exists when the imperiled ship moves in zig-zag lines, but I hope that the excellent graphical method which you have depicted in your editorial note will enable further developments. I should be very glad if the correct graphs for moving ships would attract the attention and interest of someone concerned in these matters.

BUDAPEST, HUNGARY. BÉLA GÁTI.

## The International Electrotechnical Commission—Some History-Making for the A. I. E. E.

*To the Editors of Electrical World:*

SIRS:—In your editorial commentary on the *Transactions* of the International Electrotechnical Commission, in the issue of May 27 (p. 1255), I find the following statement: "In the absence of an official delegate from the A. I. E. E., Mr. C. O. Mailloux, then in London, attended the sessions at the direct invitation of the honorary secretary."

This statement might be taken to imply that I was still some sort of unofficial delegate of the A. I. E. E. on that occasion. I would like to have it understood, distinctly, that such was not the case. The truth is that I had declined, and quite emphatically, to be the delegate of the A. I. E. E., and that, instead of merely happening to be "then in London," I *went* there *on purpose* to attend, on the invitation of the honorary secretary. I had decided on this course before I left America. I accepted that invitation because it was a *real* honor, evincing due appreciation of the services rendered by Dr. F. B. Crocker and myself, in 1906, at the time the commission was formed. The most important work done then—that which was most vital to the organization of the commission—was done by Colonel Crompton, Dr. Crocker and the writer. Without this work—and I must not forget the valuable services of the indefatigable secretary, M. le Maistre—the commission would have been stillborn. Those who are disposed to doubt this statement can find evidence supporting it on almost every page of the printed records of the sessions of 1906. The special vote of thanks given to the writer (the only vote given to a delegate) is of itself sufficient indication of the part played by the delegation of the A. I. E. E. at the time.

Many persons have wondered why I refused the "honor" of being again the delegate of the A. I. E. E. at the last meeting, in October, 1908. It is because I deemed it not an honor but a humiliation and an insult, under the circumstances. We have heard of the person who finally got tired of being "played for a sucker." I admit that I was, and I add that I am still, in that frame of mind, in regard to my participation in gatherings of an international character. I know that this is a strong statement; but I think I am justified in making it. I think I have had at least as much experience as anybody in the A. I. E. E. in gatherings of this kind. I know some interesting incidents—*quorum pars fui*—and a few inside facts and details relative to some history-making in which the A. I. E. E. was more or less deeply concerned; these will suffice as a basis for my statement. I think it worth while to recall some of them.

Let us go back to 1900. In August, of that year, in Paris, at the Electrical Congress, the A. I. E. E. escaped a great set-back or defeat, and won a great victory at the last hour. How was the rout turned into a victory, and by whom? Ask Hering, Pope, Arnold, Crocker, Weaver and others of the A. I. E. E. who were there. To appreciate fully what that victory meant let us see how matters stood just before the "battle." The A. I. E. E. was the sponsor and the advocate for two new units, the "maxwell" and the "gauss." In spite of the heroic efforts of their two formal champions, Kennelly and Hospitalier, and the good work done by them in the special committee appointed to report on these units, the prospects of favorable action had become less and less bright and more discouraging as the end of the congress approached. At the last session of Section A (physics section), on the morning of the last day, the committee report, when presented by Hospitalier, chairman of the committee, had led to a spirited discussion, which had revealed immense and seemingly unsurmountable opposition to these units on the part of men like Mascart, president of the congress; Kohlrausch, of Germany; Ayrton, of England, and many other eminent and influential men. Kennelly had left for America the day before. Dr. Crocker had also left Paris. Hering, then president of the A. I. E. E., Hospitalier, Weaver, and the writer, were about the only ones

left who had the courage to defend the units. In spite of our protests a course was decided upon—a clever move on the part of Mascart, who presided—to put these on the shelf. They were not to be even proposed for recognition or acceptance as international units. The few who still favored giving these units international sanction instead of burying them alive, got together, after the session of Section A, to hold a sort of caucus during lunch—at "Foyot's." There was, undeniably, a general feeling of despondency and discouragement. Indeed, all except *three* of those present felt that there was nothing more to be done; that the battle had now been fought and lost. Hospitalier, our stanchest friend in this fight, had given up hope, and was in favor of accepting the verdict which had just been rendered in Section A. He feared that the appeal to the "higher court" of the Chamber of Delegates, where Mascart was to preside also, would result in a still more crushing defeat and the total discrediting of the units. There was certainly much wisdom in his advice, based as it was on thorough knowledge of all the circumstances and men against us. The three, and the only three who still stood firm and were disposed to fight *"quand même"* were: Carl Hering, *president;* W. D. Weaver, *Editor Electrical World;* C. O. Mailloux, *layman delegate.* These three decided that the A. I. E. E. would *not* "give up the ship," but would take up the fight again that afternoon in the Chamber of Delegates. On account of his knowledge of European men, manners and languages the writer was made the "minority leader." It was a "job" that was bound to be "strenuous," like that of Leonidas and the 300. We were entitled to *three* delegates for the United States. I was "made" one of the three for the occasion. As we left Foyot's, Hospitalier said to me that I was about to beard a lion in his den; and that I would be "chewed up" in short order and without ceremony, by the great and influential Mascart and his followers, who were known to be in overwhelming majority. Well, what happened? Mascart did do exactly as Hospitalier had predicted in all respects, except the "chewing up" part. Taking the action of Section A as a basis and an excuse, he proceeded to put our units on the shelf and to argue that "further action was unnecessary." The thing was done so neatly and so quickly that there was no opportunity for discussion until the case was, as he thought, settled and closed. He was mistaken there; the fight was only about to begin. The lion *was* bearded in his den. The fight was long; it lasted more than an hour; it was, at times and by turns, bitter, desperate, and uncertain. But the writer had gone in to tame that lion; and he did tame him, and also some of the other lions in that menagerie, before the "fuss" was over. The final victory was not only complete; it was glorious. At the outset everybody was against us except our honorary member, Sir Wm. H. Preece, and at least one of his colleagues (Dr. S. P. Thompson), who rallied gallantly to our support at a critical moment and helped stem and turn the tide of opposition. At the end there was a veritable stampede "to get on the band wagon"; and Mascart himself was not the last one to get on. The unexpected happened; the final vote was not only *in favor,* but it was *unanimously so.* At the beginning of the fight everybody attacked me; at the end, everybody complimented me. Hospitalier, who was not an official delegate, but had been a spectator, threw his arms around my neck with joy. I sought Mascart at the end of the session, for the purpose of smoothing out any hard feelings; and even he was gracious and complimentary, though he had least cause to be. I will never forget his words: *"Je ne vous en veux pas du tout; au contraire, je sais bien aise de vous féliciter. Vous avez fait preuve de talents extraordinaires. Si j'avais une cause á plaider devant un congres international, je ne voudrais pas un meilleur avocat que vous pour la plaider."*

This was a flattering testimonial from such an eminent man. The most interesting part of the story remains to be told, however. What was my official status in that Chamber of Delegates? I had *none at all,* in reality. I was not an official or Government delegate; not even an "alternate." I was simply *made* a "substitute" for Kennelly, who, as already stated, had left for America. Any person could have had me "unseated," as not being officially accredited by the United States Government. I actually feared it. Having resorted to parliamentary tactics myself and raised *several* "points of order" to gain *my* points, I wondered that somebody did not spring *that* point of order on me. It would, of course, have been a serious one. Fortunately, my statement about my being the substitute and spokesman for another did not cause any comment; and then I felt safer. I said at the time that this should be a lesson to us. We should see to it that our spokesman has proper official credentials. I determined that I would never take any such chances again on any international occasion.

Such is the inside history of the maxwell and the gauss. The official records gave me no credit whatever; Mascart had done it all; he was even credited with having *proposed* the adoption of these units. The official record says that I, and also Preece, made a few "observations." Even my worst enemies would admit that I did good work on that occasion. I got no credit for it officially or otherwise. Nobody connects me with the maxwell and the gauss.

I come now to the International Electrotechnical Commission. In 1906, when this commission was formed, I was again played as a substitute. Nobody had thought of making me a place in the delegation until the last moment, when Steinmetz declared he was not going and others were not certain to go. Then the committee was "enlarged"; I was literally "tacked on" to the committee, and to the delegation, *at the last minute.* Though I did not like this, I accepted. I went; I worked, with my colleague, Crocker; and the records are there to show what we did and accomplished. On my return I notified the then president (Sheldon) that I had had enough "substituting" in international affairs and that henceforth I would insist on something more appreciative of my record. The rest of the world expected that Dr. Crocker and myself would be recognized and honored in the formation of the American Committee. I did not hesitate to say that I expected it, too, and for both Dr. Crocker and myself. I stated definitely what place I *would* accept and what I would *not* accept. The "slate," I was told, would be made up on a basis acceptable to us both. When the president officially promulgated his appointments, however, I found myself put down a peg or two to make room for somebody else. Dr. Crocker did not fare any better. After he had been notified of his appointment as secretary of the committee, his name was left off the committee altogether and somebody else was put in his place, without a word of warning or notice. I declined the appointment with promptness and emphasis. I have been urged repeatedly in letters from both sides of the Atlantic to take a place on the committee. I have refused and will continue to do so. I have made it very clear that I do not care to be put in the "back-seat" class in international affairs, when the rest of the world gives me a standing much nearer the front seat. Mr. Stott understood this well when he appointed me chairman of the delegation to the Marseilles Congress. I am as proud of my record there, last September, as of my record on the previous international occasions. I can say that I received more than my share of attention and courtesy at Marseilles. I would have received still more if I had been also a "Government" delegate. I would not then have had to give way, on certain official occasions, to the official delegates of even the smallest and least important countries. The officers of the congress were more worried about this than I was, however. It was the fault of our Government that it had no official representation. The A. I. E. E. should get an official credential for its delegates on such occasions.

The "last straw" which broke the limit of my patience was when the attempt was made, last August, to play me once more as a "substitute" and again at the last moment, to represent the A. I. E. E. at London in October. Again, it was found that none of the worthy people on the front seats in the committee was going. It was reported that *I was* going abroad. Why not "extend" the committee again, as in 1906, and thus "qualify" me to be a delegate? It was a brilliant idea. Unfortunately, it was "worn out" with me; and it did not work. In the mean-

time I had received intimation that I would be welcome and honored if I "happened" to be in London about the time of the meeting of the International Electrotechnical Commission. I *was* there. I did *not* represent the A. I. E. E. I made no concealment of my having refused to do so and of the reasons why. I was able, nevertheless, to take part in the work of the commission; and there is another vote of thanks placed to my credit; and again I am proud of my record as the printed transactions give it. My European friends were more than good to me, then, as they had been at Marseilles. I was and I am very grateful for their appreciation of me. With that appreciation I do not miss so much the lack of appreciation and consideration shown by the A. I. E. E. in trying to give me "left-over" honors twice.

This is the story of some history-making for the A. I. E. E., and of the way it has been recognized and appreciated here and abroad.

NEW YORK. C. O. MAILLOUX.

# DIGEST OF CURRENT ELECTRICAL LITERATURE

*Abstracts of the important articles appearing in the electrical periodical press of the world*

## Generators, Motors and Transformers.

*Voltage Regulation of Three-Wire Dynamos.*—F. NIETHAMMER AND R. CZEPEK.—If in a two-pole, direct-current machine two diametrically opposite points of the armature winding are connected with two slip-rings, this machine (which was first devised by Dolive-Dobrowolsky) can be used to supply direct current to a three-wire network when the neutral wire is connected to the middle point of an inductance coil the ends of which are connected to the two slip-rings. If the inductance coil is subdivided, as shown in Fig. 1, so that the lever $H$ may be connected to any of the points 0 to 6, it is possible to vary the voltage between the terminals $K_1$ and $K_2$ within certain limits, although the voltage between $K_1$ and $K_3$ remains constant. The theory of this arrangement is given. Apparatus, without self-induction, and without counter e.m.f., like incandescent lamps, may be connected to the terminals $K_1$ and $K_2$, while the terminals $K_1$ and $K_3$ may be used for motors.—*Elek. und Masch.* (Vienna), June 27.

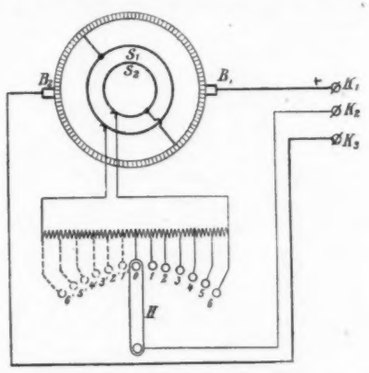



FIG. 1.—VOLTAGE REGULATION OF THREE-WIRE DYNAMOS.

*Alternating-Current Generator.*—T. R. LYLE.—A long and highly theoretical paper. It has been usual hitherto to ascribe the distortion of the wave-form of the current given by an alternating-current generator to: first, lack of uniformity and pulsation of the magnetic field, causing a distortion of the induced e.m.f. at open circuit as well as under load; second, pulsation of the reactance causing higher harmonics under load; third, pulsation of the resistance causing higher harmonics under load also. Another cause has, however, been generally overlooked, namely, the mutual reaction between the armature and the field m.m.f., which, when the generator is loaded, is at least as important as any of the three foregoing causes. This means that the theory of the simple alternator has not yet been completely worked out. In the present paper this is done for an alternator with a uniform field by means of a new application of the vector method in which all of the harmonics of a periodic function are dealt with simultaneously. The paper shows how to take account of hysteresis and eddy currents, and the theory of the action of dampers in reducing the heating of the field coils and core is also given. The theory of the alternating-current synchronous motor is also dealt with.—*Phil. Mag.*, July.

*Currents in Bearings and Axles.*—FLEISCHMANN.—In high-speed alternating-current machines of large output, sparks are sometimes observed at the bearings. They are due to currents passing through the bearings and axles. The author gives the theory of these currents.—*Elek. Kraftbet. u. Bahnen,* June 23.

*Heating of Dynamos.*—E. J. BRUNSWICK.—A discussion of the determination of the temperature of dynamo windings by electric resistance measurements. This method, however, gives only a mean temperature, since the whole winding is assumed to be of uniform temperature. The author discusses the method, the sources of error, and the corrections which can be applied.—*L'Industrie Elec.,* June 25.

## Lamps and Lighting.

*Carbon Lamps and Tungsten Lamps.*—AL. BERNINGER.—An account of an experimental investigation of the characteristic properties of carbon and (Kuzel colloid) tungsten lamps. The relation between the spherical hefner candle-power and the voltage $v$ at the terminals is given by the equation:

$$\text{spherical hefner cp} = Cv^n.$$

The values of the constant $C$ and of the exponent $n$ were experimentally determined:

| | |
|---|---|
| 10-cp carbon lamps: | $C = 16 \times 10^{-13}$, $n = 6.3$ |
| 16-cp carbon lamps: | $C = 80.6 \times 10^{-13}$, $n = 6.1$ |
| 25-cp carbon lamps: | $C = 37.5 \times 10^{-13}$, $n = 6.31$ |
| 32-cp carbon lamps: | $C = 2.89 \times 10^{-13}$, $n = 6.94$ |
| 32-cp 110-volt tungsten lamp: | $C = 2.5 \times 10^{-7}$, $n = 4.05$ |

While the candle-power of the tungsten lamp varies with the 4th power of the voltage, that of the carbon lamp varies with the 6th or 7th power of the voltage. This difference has to do with the change of resistance of the filaments with temperature, the temperature coefficient of the carbon filaments being negative, that of tungsten being positive. The author then discusses the variation of candle-power with the power in watts. If $i$ is the current in amperes the equation is

$$\text{spherical hefner cp} = K(vi)^x.$$

The experiments gave the following values for $C$ and $n$:

| | |
|---|---|
| 32-cp carbon lamp | $K = 1.5 \times 10^{-5}$, $x = 3$. |
| 32-cp tungsten lamp | $K = 1.1 \times 10^{-3}$, $x = 2.58$ |

According to Lucas, the exponent $n$ should be 3.2 for a theoretical black body. The carbon filament behaves, therefore, more like a black body than the tungsten filament. The author then determined the distribution of light from a carbon lamp and a tungsten lamp, both of 32 cp. He finds that the tungsten lamp is greatly superior in giving a more uniform illumination in all directions. The carbon and tungsten lamps were then subjected to a long-time test, during which they were connected to the same alternating-current supply mains. It was found that the exponents $n$ in the above equations remained practically constant, while the coefficients $C$ and $K$ changed gradually. The variation of the resistivity of the tungsten lamp in time is very irregular, while the curves giving the change of resistivity of the carbon lamp in time are always almost straight lines. The above relation between candle-power and voltage permits one to determine the influence of variation of voltage on the spherical candle-power. The author gives curves which show that if the voltage varies 1 per cent upward and 1 per cent downward, a total of 2 per cent, the variations

of candle-power are for a 10-cp carbon lamp, 12.6 per cent; 16-cp carbon lamp, 12.2 per cent; 25-cp carbon lamp, 12.62 per cent; 32-cp carbon lamps, 13.88 per cent; 32-cp tungsten lamp, 8.1 per cent. If a candle-power variation of 10 per cent is permitted the maximum permissible voltage variation for carbon lamps is 1.6 per cent and for tungsten lamps 2.5 per cent.—*Elek. u. Masch.* (Vienna), June 27.

*Carbon-Filament Mercury-Vapor Lamp.*—A description of the carbon-filament lamp of R. Hopfelt, in which the carbon filament is lighted in a mercury-vapor atmosphere. It is now on the market under the name of "Tuba" lamp. The construction is shown in Fig. 2. The carbon filament, which is especially prepared, is enclosed in a U-shaped tube containing a drop of mercury and some nitrogen at a pressure of about 1 mm When current is switched on, some of the mercury is evaporated by the heat produced by the filament. Owing to the presence of the mixture of mercury-vapor and nitrogen which

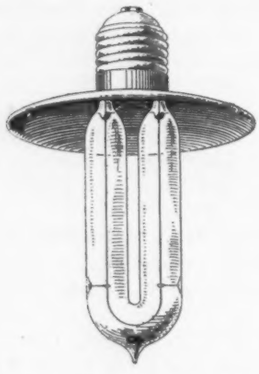


FIG. 2.—"TUBA" CARBON-FILAMENT LAMP.

is formed, the filament can be run at a much higher efficiency than is advisable with the ordinary carbon-filament lamp without any fear of the tube blackening or the filament burning out prematurely. Originally the tube was enclosed in an outer globe, so as to make a stronger lamp and to facilitate the attachment of the cap, but, owing to the higher temperature attained by the tube, this arrangement was found to shorten the life of the filament so much that the outer globe was discarded. When the lamps are new they consume 1.8 watts per hefner candle or 2.5 watts per British candle, but toward the end of their life the consumption decreases to 1.5 watts per hefner candle. The lamps burn in any position, but not satisfactorily when the U-tube is inverted as then the filament is not near enough to the mercury. The candle-power is temporarily increased when the pressure of the mercury-vapor is increased by causing the tube to heat up, but the life of the filament is shortened. The mercury-vapor does not glow itself, but, owing to the high temperature of the filament, a whiter light than that from the ordinary filament lamp is emitted. The life is 500 hours when running continuously, and between 600 and 800 hours when used intermittently. 100-volt to 150-volt lamps are made in two sizes of 25 cp to 40 cp at a price of 38 cents, and the 200-volt to 250-volt 50-cp lamp is sold at 50 cents. A specific consumption of between 1.6 watts and 1.8 watts per candle is guaranteed, and the lamps are suitable for both continuous and alternating current.—Lond. *Elec. Eng'ing,* July 1.

*Metallic-Filament Lamps.*—A note on a recent (British) patent of H. Kuzel (25,044, 1908; June 24, 1909). When metallic filaments are so held by supports that they are compelled to occupy a certain position, it is sometimes found that the tension in the different legs of the filaments varies considerably, often resulting in the breaking of the filament. According to this invention, the filaments are given a square or polygon-shaped loop with angular corners by hanging a weight from two or more points on the filament during the sintering process. When filaments of this shape are supported loosely at two or more points along the limbs, and not at any portion of the loop, it has been found that unequal tension is avoided.—Lond. *Elec. Eng'ing,* July 1.

### Generation, Transmission and Distribution.

*Steam Turbines.*—A. S. Blackman.—A paper read before the British Municipal Electrical Association on "steam turbines from the user's point of view." The author first relates his experience of the relative advantages of the impulse and reaction types of steam turbines, and discusses the most efficient relation of output and speed. The impulse-type turbine lends itself to a more mechanical-looking construction than the reaction type. The reaction type, as illustrated by the best Parsons machines, is more economical than the impulse type. For speeds of 3000 r.p.m. and below 1000 kw, the impulse type is better than the reaction. For speeds of 1500 r.p.m. and up to 3000 kw the reaction type has proved most satisfactory. For speeds of 1000 r.p.m. and 750 r.p.m. and up to the largest sizes likely to be used, there is absolutely no evidence that the impulse type can compete in reliability or economy with the Parsons type. Concerning the selection of the best speed the author said to choose the size of the unit to suit the highest speed that the frequency will allow, and here the assistance to be obtained from external fan cooling of the generator should not be overlooked, because the higher the speed at which the set is run, the greater the benefits which will be obtained from a turbine installation. He then discussed turbine versus reciprocating engines and summed up the conditions for the turbine installation as follows: (1) 150 lb. per square inch steam pressure—because at higher pressures the volume becomes small and leakage percentages are increased, with only a small gain in heat units available; (2) 150 deg. superheat—because there is no appreciable gain in plant over-all economy above 150 deg. superheat; (3) highest possible speed; (4) best vacuum possible—because it is the strongest feature in turbine working, and it will pay to maintain as high a vacuum as possible. The author finally discussed condensing equipment and exhaust-steam turbines and gave data on the reliability and maintenance of turbines on the experience at Sunderland, where the cost of working a turbine plant has been much lower than with reciprocating engines.—Lond. *Electrician,* June 25.

*Conservation of Water-Power.*—E. R. Taylor.—A paper read before the International Congress of Applied Chemistry in London. The author gives statistical data on the amount of power that could be developed by careful regulation of streams. He remarked that the regulation should not be done by individuals, but the nation should undertake the improvement and control water-powers, prevention of floods, etc.—*Electrochem. and Met. Industry,* July.

### Traction.

*German Street Railway Statistics.*—On March 31, 1908, the number of street railways in existence or in course of erection was 165 in Prussia, 72 in other German States, the total for Germany being, therefore, 237, with 3850.5 km (2387 miles) aggregate track length. Of these there were in operation in Prussia 162 roads with a length of 2652.5 km (1645 miles); in other German States, 72 roads with a length of 1128.5 km (700 miles); total in Germany, 234 roads, with a length of 3781 km (2345 miles). The increase in the number of roads over the year previous is four (two in Prussia and two in other German States). The motive power on street railways in 1907 was as follows:

IN PRUSSIA.

| | | |
|---|---|---|
| Steam locomotives | 13 roads, or | 7.9 per cent |
| Electric motors | 129 roads, or | 78.2 per cent |
| Horses | 15 roads, or | 9.1 per cent |
| Steam locomotives and electric motors | 1 road, or | 0.6 per cent |
| Electric motors and horses | 3 roads, or | 1.8 per cent |
| Cables | 4 roads, or | 2.4 per cent |

IN OTHER GERMAN STATES.

| | | |
|---|---|---|
| Electric motors | 60 roads, or | 83.3 per cent |
| Horses | 7 roads, or | 9.7 per cent |
| Steam locomotives and electric motors | 1 road, or | 1.4 per cent |
| Cables | 4 roads, or | 5.6 per cent |

Electric operation is replacing horse or steam traction. While on March 31, 1901, horse traction was used in Prussia on 24 roads, with 163 km length, this is now (1907-8) the case only

on 15 roads, with 68 km length, mostly small roads. The rolling stock in Germany consisted in 1907 of 81 steam locomotives, 57 electric locomotives, 9908 electric motor-cars, 17,263 passenger cars (including motor-cars and trailers), 69 express cars, 937 freight cars, 17 mail cars, and 1124 "special cars." The largest rolling stock is owned by the Grosse Berliner Strassenbahn, which has 2544 cars, with carrying capacity for 85,573 passengers. Hamburg is next with 1269 cars, for 36,693 passengers. Most of the roads are owned by private companies, although municipal ownership is slowly advancing. Ninety-five roads in Prussia (the same number as in 1906) and 42 roads in other German States (against 43 in 1906) were owned by companies, while 61 roads in Prussia (against 57 in 1906) and 24 in other States (against 23 in 1906) were owned by municipalities or counties. Eight German roads are owned by private companies and three roads are owned by the State of Saxony. The gage is 1.435 m (4 2/3 ft.) on 61 roads, 1 m (3 1/3 ft.) on 148 roads, and less on 28 roads. The capital invested in all German street railways was 904,630,453 marks (about $226,000,000), or 239,319 marks (about $60,000 per kilometer; 1 km = 0.62 mil). Of all German roads 22 have not paid expenses at all. The interest earned on the capital invested in 145 Prussian street railways (found by subtracting expenses from receipts, when the expenses include ordinary amortization, but not interest and amortization on the capital borrowed) was nothing in 18 roads; up to 1 per cent in 6 roads; up to 2 per cent in 14 roads; up to 3 per cent in 9 roads; up to 4 per cent in 14 roads; up to 5 per cent in 23 roads; from 5 per cent to 10 per cent in 54 roads; above 10 per cent in 7 roads. Concerning the traffic in the principal German cities the following figures on the length of track and the number of passengers per capita are interesting: For every 10,000 inhabitants there are 5.23 km track length in Hanover-Linden; 2.60 km track length in Dresden; 2.56 km track length in Essen-Ruhr; 2.30 km track length in Leipzig, and so on, and 1.22 km in Berlin. For every 10,000 inhabitants there were carried on street railways 1,972,473 passengers in Cologne; 1,925,462 passengers in Frankfort; 1,873,457 passengers in Leipzig; 1.773,377 passengers in Dresden; 1,715,823 passengers in Hamburg-Altona; 1.667,307 passengers in Berlin; 1,594,308 passengers in Düsseldorf. The average receipt for passengers varied between 7.9 pfennigs (1.97 cents) in Breslau and 11.1 (2.77 cents) in Essen-Ruhr. The total track length of all street railways and interurban light railways in Germany was 12,277 km (7612 miles) in 1907, an increase of 3.7 per cent over the year before. The capital invested in these roads was 1,510,354,116 marks (about $377,588,529) or 115,952 marks (about $28,988) per kilometer. The street railways and interurban light railways are of an essentially different character. While 63.6 per cent of all German street railways carry nothing but passengers, this is the case only for 1.9 per cent of the interurban light railways, while 98.1 per cent carry either passengers and freight or freight only. Further, in the street railways electric traction is replacing horse and steam traction, 78.2 per cent of all street railways being operated electrically, while 91.2 per cent of the interurban light railways are operated by steam.—*Zeit. f. Kleinbahnen*, April.

*Hungarian Street Railway Statistics.*—W. MAURER.—During 1907 no new electric street railway was opened in Hungary. The number of roads is 14, but the track length has increased from 201 km to 209 km (130 miles). The track length of all electric street railways in Hungary is 68, the balance being operated by horse or cable. The total capital invested in the 14 electric roads is 110,465,634 crowns (about $22,100,000), or 534,632 crowns (about $107,000) per kilometer. The average profit was 8.175 per cent of the invested capital.—*Elek. u. Masch.* (Vienna), June 27.

*Energy Transmission Systems and Light Railways.*—O. PETRI.—A statistical article on the development of electric street railways and light interurban railways, and the advantages which may be obtained by buying the energy from a transmission plant. It is shown that if the energy is bought at 1.5 cents per kw-hour, light electric railways could be operated more profitably; in this case the possible increase of interest on the capital varies from 0.2 per cent to 4 per cent and averages 1.37 per cent. Close co-operation between energy transmission plants and light railways would also be of advantage to the transmission companies, since the result would be a further extension of the transmission network, whereby electric energy would become available for many other purposes in agriculture.—*Elek. Kraftbet. u. Bahnen*, May 24 and June 4.

*New Mountain Railway.*—H. MORGENTHALER.—An illustrated description of the Wengernalp railway in Switzerland, which is now being changed from steam to electric operation. Energy is supplied from the new plant of the Jungfrau Railway, which, when completed, will contain four generating sets, each of 1250 hp, and two sets, each of 2500 hp, three-phase current being generated at 7000 volts and 40 cycles. For operating the railway the three-phase current is transformed into direct current.—*Elek. Kraftbet. u. Bahnen*, May 24.

*Electric Traction on Main Railways.*—R. RINKEL.—The author discusses the prospects of electric operation of main railways, with special reference to the objections raised by army officers. If certain precautions are taken, reliability of operation with respect to the transmission line is thought to be as fully safeguarded as with steam traction. Cables would be preferable, but they are too expensive. With respect to the power plant, it may be advantageous to connect a railway system, especially near the border line, with two plants instead of one. Countries which must import fuel, but have water-powers, should be specially anxious to introduce electric traction, since in case of war the fuel supply could be cut off.—*Elek. Kraftbet. u. Bahnen*, May 24 and June 14.

### Installations, Systems and Appliances.

*Automatic Reversible Booster.*—With reference to recent installations of some large (2000 amp or more) boosters for two British railway plants, the Lancashire automatic reversible booster is described. This machine consists of two essential parts, the motor and the booster, the former of which is supplied from the busbars, its starter being arranged on the "live" side. The motor-breaker, as will be seen from the diagram (Fig. 3), is connected in a special manner with the battery-

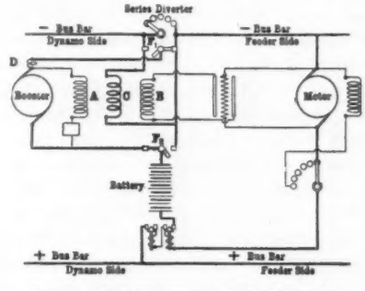



FIG. 3.—DIAGRAM OF CONNECTIONS.

breaker. The effect of this arrangement is that the motor can never be cut off when current is passing through the booster, an accident which would cause the booster to accelerate to a dangerously high speed. As will be seen, when the battery-breaker comes out it leaves the motor running on the battery, although cut off from the busbars; while, if the motor-breaker comes out, the motor is left running on the busbars. The booster has four coils, *A*, *B*, *C* and *D*, their functions being as follows: The *A* coil is connected across the booster brushes and is, therefore, energized by the difference of voltage between the busbars. Supposing the battery to have a pressure of 10 volts higher than the busbars, the *A* coil will then cause the booster to oppose the battery voltage by this amount. On the other hand, if the battery volts are lower than the busbar volts, the *A* coil will cause the booster to act in favor of the battery to the same required amount. Hence, in every case, the result will be that the algebraic sum of the battery and booster pressures will be equal to the busbar pressure. The *D* coil consists of a few turns on the booster field cores in series with the booster armature. These turns balance the armature m.m.f.

and cause the booster to act as if there were no voltage drop in it. The action of the *A* and *D* coils then causes the booster to balance all variations of the battery coils. If these coils were only in action, the effect would be to make the booster unstable. It would, in fact, rush off with a charge or discharge at its own will. A controlling force, therefore, is required, and this is supplied by the action of the *B* and *C* coils. The *B* coil is constant in its action, being energized by the busbar volts. It is controlled by a "potentiometer" resistor instead of by an ordinary resistor. When the booster is working in the ordinary way with the generators running, the excitation of this coil is in such a direction as to cause the current from it to charge the battery. It is conveniently connected across the motor brushes, as it then becomes quite dead when the motor is disconnected. The *C* coil is arranged to take the main dynamo current proportion of it, and its adjustment can be arranged by the diverter shown in the diagram. The current passing through *C* coil energizes the booster in such a manner as to take the current out of the battery. Hence, it is opposed to the *B* coil. The action of the *B* and *C* coils is as follows: Assume the boosters to be in operation and running with the generator. If the *B* and *C* coils be adjusted for, say, 100-amp generator current, then at this load they will neutralize each other, and the booster will neither charge nor discharge the battery. If, however, an excess load comes on to the feeders, the generator will give out a little more current, which, passing through *C* coil, will strengthen the latter's action. This will cause the *C* coil to overpower the *B* coil's action, and so draw the excess current needed on the feeders from the battery. When the feeder current is reduced below 100 amp a little less current will be supplied by the generator, and there will be a little less through the *C* coil and its action will become weaker than that of the *B* coil. The superior strength of the *B* coil will cause the excess current to charge the battery, so that the load on the generator will still remain at the standard of 100 amp. The load on the generator can always be adjusted by varying the strength of the *B* coil regulator, and also by adjusting the diverter. It is advisable to adjust the coils at varying periods of the load to get the best possible results from both the booster and the battery. For instance, when the load on the feeders is such that the generators are always working at their full output the action of *C* coil must be increased by reducing the current diverted through the resistor, thus increasing the amount passing through the *C* coil. The strength of the *B* coil must also be increased. The *A* coil should also be run with the resistance of the resistor largely cut out. The diagram shows the arrangement adopted for starting the set with the main generator running. The switches $F_1$ and $F_2$ are closed on their right-hand and left-hand sides, respectively, while the series diverter is over on the left. The battery-breaker is closed, thus connecting the motor to the busbars, and the latter is then started in the usual way by means of the motor starter. The *A* rheostat is put in its open position, and the *B* rheostat adjusted until the paralleling voltmeter shows that the battery volts are equal to those on the busbars. The motor-breaker is then closed and the load on the generator and battery is adjusted with the *B* rheostat. The *A* rheostat is placed at its most sensitive position, which can be adjusted by the series diverter. When the arm of the latter is in the extreme left position the booster will act strongly and will keep the load on the main generator steady. On the other hand, when it is on the right-hand side, the battery will do less work and the generator load will vary with the feeder load.—Lond. *Electrician*, June 25.

*Large Industrial Load in a British Central Station.*—Owing to the great energy with which the electricity department of the city of Bolton, in Lancashire, has pushed electricity supply for industrial purposes, this station has "almost obtained the ideal of being able to make the industrial, rather than the lighting, its staple load." On account of the gradual evolution of the plant, three systems are used: direct current, single-phase current and three-phase current, the latter mainly for industrial purposes. The main part of the three-phase current is used for cotton-spinning work, there being at the present time something like 300,000 spindles driven by energy obtained from the corporation's mains, but in no case is a complete mill driven electrically. Electricity is also used in several engineering and steel works. During the last year the total output from the Bolton station was 10,677,764 kw-hours, of which no less than 64 per cent was for industrial purposes pure and simple, while only 15 per cent was for lighting. The average price obtained per kw-hour from all classes of supply is 2.68 cents, and for industrial purposes only 1.68 cents per kw-hour. When the electricity works first started 10.8 cents per kw-hour was charged, and the price remained well above 6 cents until the present policy was instituted in 1900. Since that date the price has steadily fallen. Although the price is now fairly low for a municipal station of the size of that at Bolton, a gross profit of 9 per cent on the capital has been obtained, and this result could be very well improved if the position of the station as regards the supply of water and cooling facilities were better. However, the cost of generating the energy is low. The works costs are 0.944 cent per kw-hour and the total costs 1.166 cent per kw-hour. The cost, including capital charges, is practically 2.4 cents, while in 1895, the first year of complete working of the station, the corresponding figure was 23.68 cents, so that a very substantial reduction has been made. On March 31, 1901 the number of motors on the mains was 27, with an aggregate rating of 148 hp. On the same date in 1909, or eight years afterward, the number of motors was 816, with an aggregate rating of 9219 hp, an average yearly increase of 100 per cent; the increase has been extraordinarily rapid during the latter part of this period.—Lond. *Electrician*, June 25.

*Central Stations and Electric Lighting.*—E. Schiff.—A contribution to the discussion now going on in this journal on the problem of increasing the popularity of electric lighting. The writer thinks that in general the high cost of electric energy is the greatest obstacle, although not the only one. The high cost is due not alone to the cost of operation of the central station, but to high fixed costs—interest, amortization, business offices, etc. It is, therefore, very important to divide the fixed cost among as many people as possible. To increase the load factor the energy should be sold at times of low load at much lower rates than are employed at present. A distinction should be made between the hours at which the energy is used and not between the purposes for which it is used. It is of great importance to fight isolated plants by lowering the rate for them as low as for traction companies. As a general policy, he advises a large general reduction of the rates, at least for large companies.—*Elek. Zeit.*, June 24.

### Wires, Wiring and Conduits.

*Insulators.*—W. Weicker.—An illustrated description of a new high-tension insulator equipped with a metallic cover at the top, in order to increase the insulation resistances, by protecting the lower part of the insulator against rain. The metal cover has the advantage of light weight over porcelain.—*Elek. Kraftbet. u. Bahnen*, June 4.

### Electrophysics and Magnetism.

*Radiation from Black Bodies.*—W. W. Coblentz.—An abstract from a Physical Society paper. The radiation from the so-called black body was investigated from 8 to 10 years ago, and the results then obtained are somewhat at variance. In view of the fact that it seems feasible to replace, or at least to supplement, the present thermo-electric extrapolations, at high temperatures, by means of a temperature scale based upon these radiation laws, it is desirable to make a thorough spectrobolometric investigation of the black body at various temperatures. In previous investigations it was thought that an accuracy of about 3 per cent had been attained. In order to attain a still greater accuracy very elaborate precautions are necessary. Contrary to some of the prevailing notions, the uncertainties in the measurements are located in the bolometric end of the apparatus instead of in the constancy of the temperature of the radiator. Two series of spectral energy-flow curves at various temperatures from 500 deg. C. to 1490 deg. C.

have been obtained—in all 33 different curves. The observations extend over a long period in which there were days when the sensibility of the apparatus, the temperature of the room, or the humidity, etc., varied, so that some of the errors due to those causes ought to be minimized in the final resultts. The data are not sufficiently worked out to make a more definite statement than that after a three-hour run it has been possible to repeat the observations in different parts of the spectrum with an accuracy of from 0.10 per cent to 0.5 per cent, and that the $T\lambda_{max}$ constant (in Wien's law) seems to be as high as any value heretofore obtained.—*Phys. Review,* June.

*Roentgen Rays.*—C. A. SADLER.—An experimental investigation of the transformations of Roentgen rays. The characteristic Roentgen radiation from a substance is found to be identical in character whether it is emitted as a secondary or a tertiary radiation. In each case the radiation is homogeneous, the absorption coefficients of the radiation by other substances are the same, and independent of the penetrating power of the exciting radiation by which these homogeneous beams are produced. The laws governing the emissions of tertiary radiation and the absorption of secondary homogeneous beams were also investigated.—*Phil. Mag.,* July.

*Electron Theory.*—F. KUNTZE.—Abstracts from old papers and books of Hermann and Robert Grassmann, in which they anticipated the modern electron theory.—*Phys. Zeit.,* June 15.

### Electrochemistry and Batteries.

*Electric Steel Furnaces.*—C. A. KELLER.—A Faraday Society paper on the type of electric steel furnaces in which the current enters the furnace through one electrode at the top—or through several electrodes in parallel—and leaves the furnace through a conducting hearth at the bottom. If the production of steel is carried out in electrode furnaces, fitted with conducting hearths, the material used must not carbonize the metal produced. The various classes of conducting hearths described are: (a) Those made entirely of metal, water cooled; (b) those consisting of one or more metallic poles embedded in non-carbonizing masonry; (c) those consisting of a hearth of refractory material rendered conducting by a carboniferous substance; (d) furnaces with a hearth made up of a mixed conducting material; this is the type devised by the author. The construction and performance of various furnaces erected by the author are also described.—Lond. *Electrician,* July 2.

*Caustic Soda and Chlorine.*—A number of papers on the subject were presented before the International Congress of Applied Chemistry in London. L. H. Baekeland gave an account of three years' practice of the Townsend cell. It is preferable to operate the cell at a comparatively high current density in order to increase the output, in spite of a diminished efficiency. Although the Townsend cell is commonly described as a diaphragm cell, it may just as well be considered as a cell with a circulating electrolyte, somewhat on the order of the gravity cell. Various other details of operation were described. Aluminum conductors proved very advantageous as they show no evidence of corrosion even after years of constant use in an atmosphere always containing some chlorine. Lepsius discussed especially the Griesheim-Elektron diaphragm cell. R. Taussig described a recent modification of the Castner-Kellner mercury-cathode cell. G. Koller discussed the use of electrolytic chlorine for making chlorine compounds of acetylene, which are non-combustible and non-explosive solvents of oils, fats, etc., with a wide range of boiling points. E. A. Sperry discussed the detinning of tin scrap by means of chlorine.—*Electrochem. and Met. Industry,* July.

*Aluminum.*—S. A. TUCKER.—A brief description in detail of suitable arrangements for preparing aluminum electrolytically in the laboratory.—*Electrochem. and Met. Industry,* July.

### Units, Measurements and Instruments.

*International Unit of Candle-Power.*—In a paper by C. C. Paterson read before the Physical Society in London, the new international agreement concerning the unit of candle-power was discussed. The paper itself contains nothing that has not been given in our issues. There was, however, an extended discussion. Dr. Fleming said that it was interesting to hear that those chiefly interested had come to an understanding with each other as to the unit of light. It must be remembered, however, that the proposed international unit has no objective existence, and no greater value as a unit of comparison than the Hefner or pentane units, to which it was related by an arbitrary definition. He greatly regretted that the National Physical Laboratory authorities had acquiesced in the adoption of a flame standard of light, with all its difficulties and variabilities. Influenced as they are by atmospheric pressure, moisture, $CO_2$, height of flame, composition of fuel and number of persons in the photometric room, these flame standards can not possibly be considered as a final solution of the problem of obtaining a primary standard of light. What is really required is the concrete realization of a permanent standard, which can be the standard of reference for secondary standards like the Fleming-Ediswan large-bulb, glow-lamp standards, which the speaker introduced seven years ago. In his paper Mr. Paterson made only a brief reference to Violle's work on the platinum standard, and ignored altogether the careful work of Professor Petavel carried out in 1899 in the Davy-Faraday laboratory. Professor Petavel's conclusions were that with suitable precautions the unit of illumination could be reproduced within 1 per cent by means of the molten-platinum standard. Elaborate experiments to ascertain how many hefners are equal to 1 pentane are not a matter of nearly such importance as the construction of some final constant primary standard of light, and, in Dr. Fleming's opinion, the most satisfactory form for this primary standard of light is to derive it from the light emitted normally by a defined area of some substance in a state of incandescence at a known fixed temperature. Dr. Russell thought that the unit suggested by Waidner and Burgess has many advantages; they propose to adopt as the unit of intensity the radiation from a square centimeter of a black body maintained at the temperature of the fusion of platinum. He referred also to the unit suggested by Steinmetz. Mr. Dow said that the pentane lamp as a standard is not very inferior to the Violle standard. He does not think one can as yet accept as a standard an area of a black body at a high temperature. Dr. Drysdale thought the international agreement arrived at is most welcome. As he understood the paper, however, it is simply an attempt to obtain agreement between existing units rather than standards, and leaves the matter of the best form of standard perfectly open. He thought that everyone having experience with flame standards would thoroughly agree with Professor Fleming's condemnation of them, and there could be no doubt that the primary standard should be an incandescence one. He, however, did not agree with Dr. Fleming's suggestion of reviving the Violle standard. What is wanted in an incandescence standard is a definite area of a definite surface at a definite temperature. When the Violle standard was suggested little knowledge was had of the radiating properties of surfaces, or high-temperature measurements, and, therefore, the only suitable thing was to take a very pure substance, using its melting point as a bench mark of definite, though unknown, temperature. However, everyone who has studied the history of the Violle standard is aware of the great difficulties of setting it up, and it has the disadvantage, according to Petavel, that the surface is dependent on the gas mixture used, that it possesses an extremely short period of constancy and requires a high expense. It is now known that a perfectly black body is easily obtainable and that it has perfectly definite radiating properties; the laws of Stefan and Wien are well established, and optical pyrometry has advanced to a high degree of accuracy. It, therefore, seems decidedly preferable to suggest a unit area of a black body at a definite temperature. Mr. Jolley and he have come to the conclusion that a square centimeter of a black body at a temperature of 2000 deg. C. absolute would perhaps be a good unit, and would probably be of the order of 100 cp. This temperature is probably quite close to that of the ordinary carbon-filament glow lamp, so that there should be no color difficulty and it should not be exceptionally difficult to maintain constant.

A point in favor of the black body is the perfectly definite character of its spectrum, which makes it a standard of color as well as of intensity, and suitable for spectro-photometric comparison. As the surface is that of a solid, it would be unnecessary to maintain it in a horizontal position, as with the Violle standard, and the amount of light can be easily varied by a diaphragm. Paterson replied that his paper dealt with the relations existing between the various units now in use. He agreed with Fleming's observations on the flame standard. With regard to Dr. Drysdale's remarks about the use of a black body, he thought that it would not be possible to keep the temperature sufficiently constant to enable it to be used as a standard.—Lond. *Electrician*, July 2.

*Singing Arc.*—G. W. Nasmyth.—An abstract of a paper read before the American Physical Society. In the usual form of the Duddell singing arc—the direct-current arc in series with a suitable resistor and choke coil—the oscillation circuit contains capacity and inductance in a shunt across the arc from anode to cathode. In the improved form, two arcs are used in parallel, each with its own resistor and choke coil, and the oscillation circuit is connected between the two anodes, the two cathodes being connected together; the two anodes may be connected together and the inductance and capacity placed between the two cathodes. The diagram of connections for the new form is shown in Fig. 4. The chief advantages of this form of the singing arc are the increased power available in the oscillation circuit, and a greatly increased stability in the oscillation conditions. The power available in the oscillation circuit is approximately twice that obtainable from the usual form of the singing arc. With two arcs connected in this way, the fluctuations

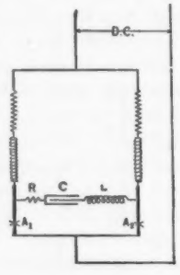



FIG. 4.—DIAGRAM OF CONNECTIONS.

in either arc have a tendency to be neutralized by the other arc and the effect on the oscillations is greatly diminished. If the arcs are surrounded by a hydrogen atmosphere, supplied by alcohol lamps or illuminating gas, the oscillations will be maintained for a time even though one arc goes out, the other arc continuing to send the oscillations through the hydrogen atmosphere. If one arc is short-circuited the connections are changed to the usual form of the singing arc, and the oscillations will continue. With this new form of the singing arc the author has obtained oscillations over a range of frequencies from two per second to 1,000,000 per second. As in the usual form, small currents—from 0.5 amp to 3 amp—give the most power, a water-cooled copper anode is of advantage. For low frequencies the arcs should be as long as possible, but for high frequencies it is necessary to shorten the arcs. The theory of the arrangement is also discussed.—*Phys. Review*, June.

*Current Balance.*—E. B. Rosa and N. E. Dorsey.—An abstract of a paper read before the American Physical Society on an investigation carried out at the Bureau of Standards on the absolute measurement of current by the new current balance. The Raleigh form of balance has been adopted as affording the possibility of determining the constant of an instrument with extreme precision, and giving a sufficiently large force to be measured accurately. Many improvements have been made over the original balance as used by Lord Raleigh, one of the most important being the use of water cooling to maintain the coils at constant temperature, so that the constant of the instrument and the forces to be measured are unaffected by the heat due to the current. The instrument, which has been in use for more than a year, has been investigated very elaborately for the purpose of obtaining the highest possible precision in the absolute measurement of current. The final results have not yet been obtained, but a report of progress will be made and the results communicated. The difference found between the present legal value of the e.m.f. of standard cells and the value given from the current balance and a resistor of standard resistance is 9 parts in 10,000. Giving the e.m.f. of the Weston normal cell the value 1.0182 volts at 20 deg. C., the corresponding value of the e.m.f. of the Clark standard cell, as at present made, is 1.4324 at 15 deg. C. This is 0.0003 less than that of the older form of the Clark cell.—*Phys. Review*, June.

*Maximum Power Meter.*—An illustrated description of an instrument intended for use in a system in which the method of charging is based on a fixed charge per year per kilowatt demanded, combined with a flat rate per kw-hour registered on the meter. The instrument is made for single-phase, polyphase, and direct-current circuits. It consists of a disk rotating between magnets against a spring, the amount of torque being proportional to the power. The spindle with its disk is fixed on a float which moves in a vessel containing oil, which not only provides the rotating medium, but also reduces the friction to a minimum by allowing the spindle to be pivoted on a top jeweled bearing. The time lag can be varied, according to the density of the oil, from one minute to one hour or more. The registering is effected by a ratchet fixed to the spindle wheel, which also serves to carry the scale. A very light pawl prevents the ratchet wheel from moving backward, and at the same time allows the scale to revolve to its correct reading.—Lond. *Electrician*, June 25.

*Thermo-Elements.*—O. Knopp.—A systematic investigation of thermo-elements made from various metals and alloys. The author first discusses the influence of the resistance of the junction on the sensitiveness of the thermo-element. He then gives in a table the constants of a series of thermo-elements made from different metals and alloys. He discusses the effect of the percentage composition on the thermo e.m.f., the effect of the thickness of the wires, and the influence of gas pressure and temperature on sensitiveness.—*Phys. Zeit.*, July 1.

*Thermo-Elements.*—K. E. F. Schmidt.—The maximum of sensitiveness of thermo-elements is at present represented by a manganin-constantan element, the thickness of the wires being 0.0154 mm and their length each 2 cm. When connected with a mirror galvanometer of medium sensitiveness such thermo-elements permit measuring a current of 0.000089 amp. —*Phys. Zeit.*, July 1.

### Telegraphy, Telephony and Signals.

*Telephony.*—Devaux-Charbonnel.—A continuation of his serial. The author takes up the calculation of the constants of a telephone line of definite length, the determination of these constants and their variation with frequency. He discusses the measurement of these constants by two methods, namely, the galvanometer of Abraham, and the bridge method with a telephone.—*La Lumière Elec.*, June 26.

*Semi-Automatic Telephone Exchanges.*—F. Lubberger.—The immediate substitution of the automatic telephone exchange for a manual system is often impossible on account of the high first cost. Semi-automatic apparatus permit a slow exchange of the instruments. They permit cheap and easy transformation into completely automatic apparatus. The author describes the apparatus introduced by the Automatic Electric Company in this country, and refers to the differing opinions in Germany. —*Elek. Zeit.*, July.

### Miscellaneous.

*British Municipal Electric Association.*—Extensive reports of the proceedings and of the papers presented. The membership of the association now stands at 390, made up as follows: Committees, 167; chief electrical engineers, 176; honorary members, 3; chief assistants, 36; the total showing an increase of three over last year's total.—Lond. *Electrician*, June 25 and July 2; Lond. *Elec. Eng'ing*, June 24 and July 1.

## BOOK REVIEWS.

HANDY COPPER WIRE TABLES AND FORMULAE. By P. B. Down. London: *The Electrician* Company, Ltd., 34 pages. Price, $1.

This little pocket book is, as its name suggests, a handy set of tables and formulas relating to wires and cables of copper and aluminum. The gages of the wires are the standard British and Birmingham, which latter is sometimes known in this country as Stub's. A comparison table of B. & S. gages is appended. Unfortunately, all of the tables are in the chaotic old British system of measures, including the pound, grain, inch, square inch, cubic inch, foot and degree Fahrenheit. The result is, of course, a mass of formulas and cross-references, a large part of which would be unnecessary if the simple metric system were employed. The tables are indeed useful and handy, but the people who have to use such a system deserve sympathy.

HEAVY ELECTRICAL ENGINEERING. By H. M. Hobart. New York: D. Van Nostrand Company. 338 pages, 101 tables, 188 ills. Price, $4.50.

Under the non-committal title assigned to this book the author discusses the over-all efficiency of generating stations and the relation between coal consumption and outgoing electrical energy, the steam-raising plant, piston engines and steam turbines, condensing plant, electric generating plant, the design of generating stations, high-tension transmission lines, the high-tension continuous-current series system, electric traction calculations, traction motors and the electrification of railways. Although design details are omitted, the whole book is arranged for use by the designing engineer, and the various statements made by the author are based on inter-related facts that are outlined.

The book contains a large amount of data presented in the form of tables and curves, the written matter being confined largely to discussions of these data. Throughout the whole book cause and effect are fully explained, and comparisons are freely made between results obtained by different methods. The information is presented in such simple form that the discussion involves the use of no mathematics higher than arithmetic. About one-third of the book is devoted to electric traction, all electrical engineering features of which are fully discussed. In view of the fact that in the preface the author refers to the "flourish of trumpets" with which single-phase traction by commutator motors was heralded by "the very engineers who had previously taken up the position that one of the chief objections to the continuous-current motor is the necessity of employing a commutator," one is not surprised to find that he subsequently mentions the "single-phase monstrosity" as an "ill-omened" system employing a motor that is "a mere apology for a motor at the best," and is seen at its worst during starting and accelerating when it is most needed, in heavy work. The author's statements concerning single-phase traction motors seem to be based on reports made by advocates of other systems rather than upon the performance of the machines in use under steam railroad conditions as recently made public in this country. The treatment throughout is interesting and should prove useful to consulting and constructing electrical engineers.

# NEW APPARATUS AND APPLIANCES

## A Modern Generating Unit.

BY C. V. KERR.

The Standard Oil Company, of New York City, has recently installed in the Sone & Fleming Works, Kingsland and Meserole Avenues, Brooklyn, a 50-kw Kerr turbo-generator set, shown in the accompanying illustration. The driving power is an 18-in. Kerr steam turbine, which developed during the factory test a maximum of 100 brake-horse-power under the operating conditions of steam pressure at 80 lb. gage with atmospheric exhaust and a speed of 2500 r.p.m.

These turbines are of the nozzle and bucket or impulse type and utilize the principle of the Pelton waterwheel. Each stage of the turbine consists of a set of circular nozzles, and the bucket wheels carry drop forged-steel, double-cup buckets riveted into the rim. As the nozzles lie in a tangent to the plane of the disks with a radial clearance, it is evident that troubles due to change of dimension by expansion in heating are entirely avoided. This radial clearance is greater than the slight swelling of the disks by centrifugal force will amount to and the end-wise motion of the shaft is limited only by the proper position of the disks with respect to the circle of nozzles. In the exhaust end bearing case, locating collars are provided which are adjustable and afford easy means of locating definitely the disks in the plane of the circle of nozzles.

Between the stages in the turbine a floating bronze bushing is provided which seats itself by difference of steam pressure between the stages. A running clearance on the shaft provides an effective steam seal when the turbine is at full speed. These bushings prove to be effective in service, as evidenced by grinding to their seats in the diaphragm casting and polishing the shaft which rotates within them.

As the steam pressure drop from stage to stage is less than that producing maximum flow of steam in most cases, the nozzles are converging in form although providing for expansion of steam through drop in pressure. The design of the nozzles is such that the areas from stage to stage, plotted, form a smoothly diverging nozzle which expands the steam from the highest pressure down to that of the back pressure whether at atmosphere or in vacuum.

The design of the turbine shell is such that the turbine can be taken completely to pieces conveniently in a very short time when it is desirable to do so. The parts, however, requiring adjustment or attention, as the bearings or the governor, are outside and of easy access. The bearing brasses are in halves and so held in the bearing case that by removing the cap both halves may be removed without disturbing the machine otherwise. Adjustment of the governor, which is of the centrifugal

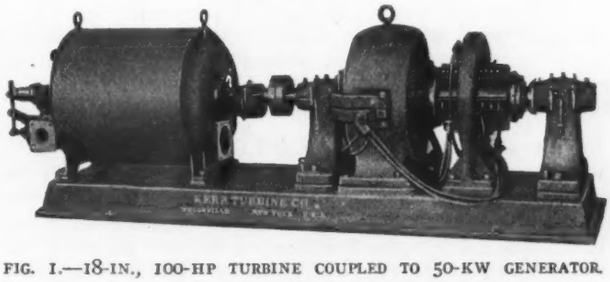


FIG. 1.—18-IN., 100-HP TURBINE COUPLED TO 50-KW GENERATOR.

type and mounted directly on the end of the turbine shaft, is made by increasing or decreasing the governor spring tension by means of lock nuts gripping on the end of the shaft. The bearings are all ring oiling, a 400 deg. Fahr. mineral oil being used on account of the heat transmitted to them by the steam and the friction heat developed as usual by the rotation of the shaft. The disks with their hubs are separately balanced on a steel mandrel and when assembled on the shaft the slight errors left in balancing tend to counteract each other so that the result is a rotor which runs with extreme steadiness.

The generator in this unit is one of a line of specially de-

signed and built generators brought out by the Northern Electric Company, of Madison, Wis., for use with steam turbines. The generator of this unit is a four-pole machine with a rated capacity of 50 kw at 125 volts and 2500 r.p.m. The armature is of the solid drum type with a core built up of laminated sheet steel. The commutator is designed for high velocity and rigidly supported on a spider in such a way as to secure permanent position on the shaft. The segments are of hard-drawn copper bars insulated with mica.

The brush holders are a special design supported on a separate quadrant or ring, as seen in the illustration. The brushes are thin, but broad, and placed in pairs with a slight space between. The effect of this arrangement on commutation was seen in the unusually good behavior when carrying 25 per cent overload. Scarcely a spark even of the pin-head variety could be found.

The efficiency of the generator guaranteed by the builders at different loads and as determined by the builders at the factory tests is as follows:

| Load | ¼ | ½ | ¾ | 1 | 1¼ |
|---|---|---|---|---|---|
| Guaranteed, per cent | 77 | 86 | 89 | 90 | 90 |
| Test, guaranteed, per cent | 78 | 86.1 | 89 | 90.2 | 90.5 |

These efficiencies were determined by the method of electrical losses in the usual way. The data of the test are plotted in Fig. 2.

The generator was guaranteed on full rated load for 24 hours to have a temperature rise not exceeding 40 deg. C. in

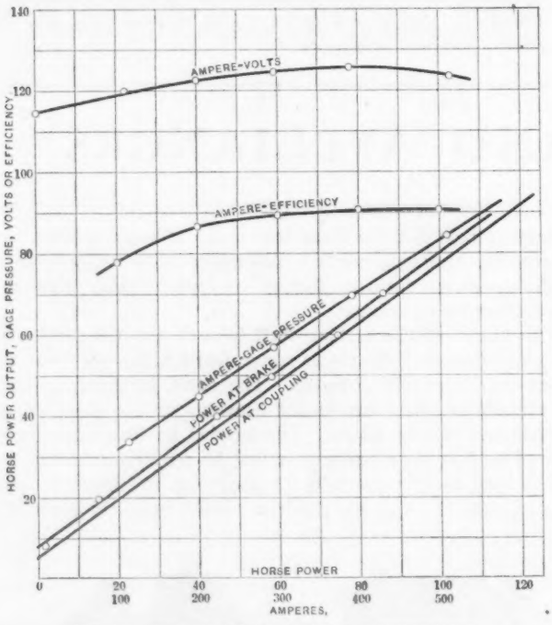



FIG. 2.—CURVES OF GENERATOR EFFICIENCIES.

any part except the commutator and there a rise of 45 deg. C. was allowed. Immediately following such a full-load run the generator was to carry an overload of 25 per cent for two hours, with a temperature rise not exceeding 55 deg. C. in any part. The data from the guarantee test made on the unit at the works before shipment showed an unusual margin to the good. The full load was carried from 8:30 a. m. till 10:45 a. m., followed by a 1¼ load until 11:15 a. m. and full load from 11:15 a. m. to 12 m.

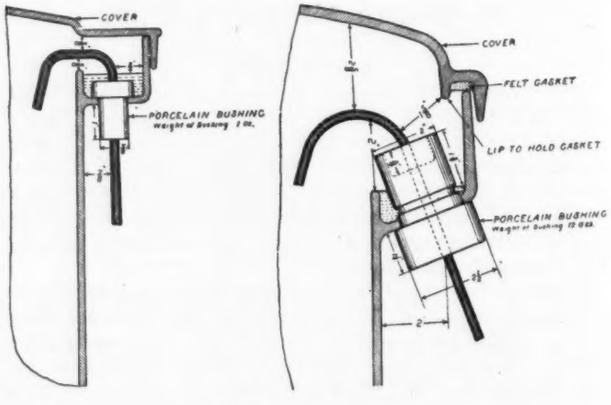
Some interesting tests were made to determine the regulation of the generator and turbine with sudden and extreme changes of load. The field windings on the generator were to be so compounded that the voltage would automatically increase from 110 volts at no load to 125 volts at full load, or any amount between the above limits as desired. The load was thrown on and off the generator by means of a circuit-breaker of large capacity. This gives the most trying condition which the unit could meet. In practice the change of load is small and more or less gradual. The data from tests showed that a 25 per cent overload was in these tests thrown off the generator as quickly as a circuit-breaker could operate. Further a 25 per cent overload was thrown on the generator in the same way. Between ¾ load and the 25 per cent overload there is a steady change in voltage of only one-half a volt. This is believed to be a very creditable performance and the tests show the apparatus to be capable of meeting the most trying conditions of this kind to be made in service.

## Transformer Bushings.

By H. W. Young.

It has always been recognized that one of the most vital features of a transformer is its insulation strength, and designers have endeavored to bring this to as high a value as possible by the use of heavy insulation in the coils, the use of oil, etc. It is, however, a strange fact that many designers in the past have left a weak link in the insulation chain by employing porcelain bushings of such design, size and location that a large percentage of the high insulation factor gained in the coils, or by the use of oil, is sacrificed by the low insulation strength at the points where the primary leads pass through the transformer case.

A good example of former practice is shown in Fig. 1, the drawing being made from a commercial type of transformer. It will be noted that the greatest distance between the leads and case is ¾ in., while the minimum distance is ⅜ in. The maximum distance between the leads and the outside of the transformer case is ⅞ in. A large number of transformers insulated in this manner have been in successful operation for years, as the spacing distances shown are sufficient to withstand a break-down test of 2200 volts if these distances are maintained and the conditions are not too severe. As, however,




TRANSFORMER BUSHINGS.

the voltage of electric light and power systems increases, greater strains are brought to bear on apparatus, and if a ground, however slight it may be, starts an arc across surfaces, such as from transformer lead to the case, the line current is very apt to follow. If the generator or line capacity is limited, the arc might readily burn itself out or be suppressed without any great amount of damage; but if the energy is comparatively large there will be sufficient power behind the arc to maintain and increase it, with the usual damage and danger.

It has been found that in locations subject to severe lightning storms a spark will frequently jump from leads to case with the older type bushing, and this will be followed by an arc due to the line current. This is especially liable to happen if the leads are loose and swing in the wind so as to strike the case. Another fact which has developed in practice is that in localities subject to dust or fumes, as in a chemical or steel-mill district, the small bushing soon becomes covered with a film which in wet weather becomes a conducting surface and

causes leakage over the porcelain from the lead to the transformer case.

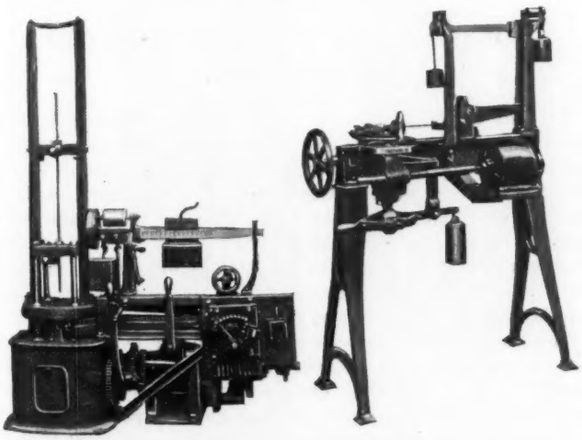
Fig. 2 illustrates an improved bushing which has been adopted for use with the Pittsburgh transformer. A comparison of Figs. 1 and 2 makes evident the greater mechanical strength of the design shown in Fig. 2. Where transformers receive rough handling this increased factor of safety is especially desirable. Electrically, the new bushings are vastly superior to the older types, their use insuring greater creeping distance, resulting in higher insulation and in ultimate strength, which could not possibly be otherwise secured. A comparison of Figs. 1 and 2 will also show that where the older forms had a maximum breaking distance of 3/8 in. and 7/8 in., the new bushings have a maximum break of 1¾ in. and 2 in., respectively. With the construction adopted it is practically impossible for a lineman so to bend the leads inside the case that they can be brought into contact with the iron, whereas with the previous forms a comparatively slight bending of the leads would bring them down onto the case.

In localities subject to heavy storms, rains, snow or sleet grounding of the line leads to the outside of the case frequently occurs, either due to wind blowing the lead up against the case, or to snow and ice packing up between the lead and the case. The danger of grounding is, therefore, always present, especially if the system is star connected, in which case a transformer wound for 2300 volts would have an actual strain to ground of approximately 4000 volts.

With the new type of bushings is secured an increased factor of safety, much desired under normal operating conditions and essential when abnormal conditions occur, such as surges, lightning discharges, etc. Under such conditions a spark will be forced to seek its natural path to earth through the ordinary lightning arresters, rather than jump from the transformer lead to the case.

## Motor-Driven Wire-Testing Apparatus.

The latest improved tensile-testing machine for wire tests is that developed by Tinius Olsen & Company, Philadelphia, well-known manufacturers of testing apparatus. The machine, illustrated in an accompanying view, consists virtually of two



WIRE-TESTING APPARATUS.

separate mechanisms, performing straining and weighing functions, respectively. The straining mechanism consists of a cross-head drawn by four screws, providing a steady, straight motion. As the screws do not rotate, all moving parts are enclosed below the base cover. The straining nuts in the base are of comparatively great length to insure a large wearing surface and consequent durability. The cross-head is driven in its vertical travel by a 1/3-hp Westinghouse motor, various speeds being obtained by change-gearing, friction drives and motor regulation. The machine is equipped with a dial vernier screw beam, long column and counterbalance wedge grip for holding the wire. This type of machine is made in sizes up to 20,000 lb., and from 30,000 lb. to 60,000 lb. for strand tests, and 100,000 lb. to 600,000 lb. for rope tests.

The Moore wire tester, shown in the second illustration, is used to apply a bending strain to the wire while under a tensile stress. The wire to be tested is gripped at either end and a stress of 25 per cent the tensile strength of the wire applied; meanwhile one of the pair of grips, connected to a swinging arc, bends the wire backward and forward through an arc of 90 deg. around the bending jaws, which are curved to a radius equal to the diameter of the wire tested. This machine, which has been found especially useful in the tempering shops of wire-cable and rope manufacturers, is motor driven, and applies the bending action until the wire breaks. It is obvious that the wire which will bend the greatest number of times without rupture is the best for rope manufacturing purposes. The motor drive of this machine by a Westinghouse motor provides a great improvement over the hand-operated apparatus, securing convenience and accuracy of a degree not attainable in the hand-driven tester.

## New Holophane Clusters.

The Holophane Company, Newark, Ohio, has introduced improvements in the glass equipment of the Holophane "arcs" or clusters whereby a much better distribution of light is secured. The comparative curve here published indicates the improvement in this regard of the new units over the old.

FIG. 1.—HOLOPHANE CLUSTER.

A separable cluster body also is now supplied so that the new arrangement can be taken apart and the glassware cleaned without breaking the electrical connection. The standard finish of the clusters in future will be brush brass. Square-linked chain is used for the suspension, and a separable canopy is supplied which does away with the necessity of a long nipple at the ceiling.

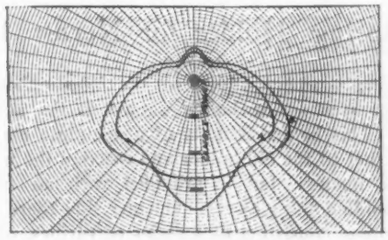


FIG. 2.—LIGHT DISTRIBUTION OF HOLOPHANE CLUSTERS.

## Electric Glue Heaters.

The accompanying illustrations show the details of electric glue heaters brought out by the Advance Machinery Company, of Toledo, Ohio. The heater is made entirely of copper and brass, and the construction is such that when the glue is brought to the proper temperature in the morning the heater may be switched out of circuit, as the heat-retaining jacket serves to retard the dissipation of heat for from four to five hours. The glue is first put to soak in soaking buckets, and after it has absorbed all the water necessary and acquired a jelly-like consistency, it is put into the glue receptacle. The latter is cylindrical in form, and is surrounded by a jacket filled with water. This water jacket is surrounded by an additional copper jacket and the wall between the outside jacket and the water jacket is filled with mineral wool. The water in the jacket is heated by means of electric coils, provided with three-

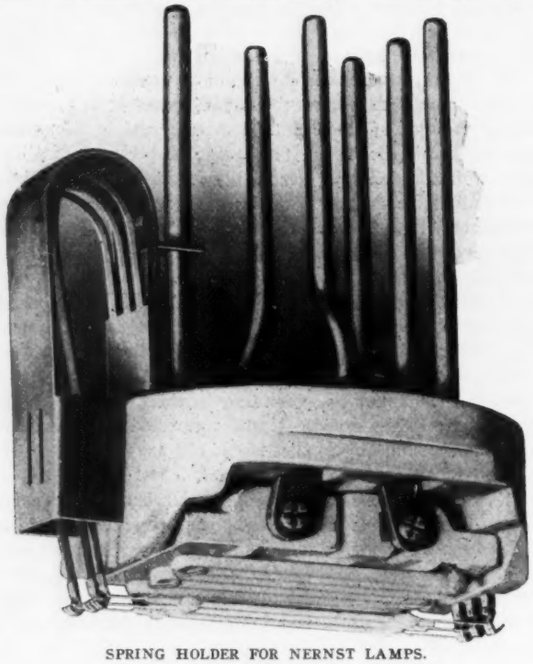
FIGS. 1 AND 2.—ELECTRIC GLUE HEATER.

way switches or several sockets, according to the size of the heater. The heaters are made as small as 1 pint or as large as 100 gal. The manufacturer claims that it is possible to dissolve the glue in 30 minutes in the morning and that the current may be switched off after 45 minutes or reduced, as the operator may desire. If the electricity is shut off entirely, the glue is said to maintain a temperature of about 150 deg. for a number of hours.

## New Spring Holder for Nernst Lamps.

Another improvement added to the Westinghouse Nernst system is the new spring holder shown in the accompanying illustration. This holder consists of a one-piece porcelain base the same as that of the old holder and receives the wafer heater in the same manner, but is provided with an entirely new device for holding the glowers. On one side there is attached a metal stamping consisting of a series of springs, one for each glower, covered by a metal guard. A corresponding number of rigid upright supports fit into slots in the opposite side of the porcelain. Small platinum jaws to receive the glowers are welded to the tips of the springs and to the tips of the upright supports.

The glowers are provided with fused beads at the ends of their platinum leads which prevent them from slipping through the jaws of the holder. Replacement consists of the simple operation of inserting the bead of the glower in the jaw on the spring side of the holder and then drawing the spring forward sufficiently to allow the other bead to drop into the corresponding slot on the opposite side of the holder. The spring tension is sufficient to draw the glower into place, which is done automatically without further attention on the part of the operator. Contact is made automatically. The pressure of the



SPRING HOLDER FOR NERNST LAMPS.

spring keeps the glowers in their correct position and does not permit them to assume any other position due to expansion and contraction.

This device makes the replacement of glowers so simple an operation that it can be done by anyone without having had electrical experience, while it greatly reduces the trimmer's time and makes it impossible for him to replace the glowers in any but the proper way.

## Storage Battery for Central-Station Night Load.

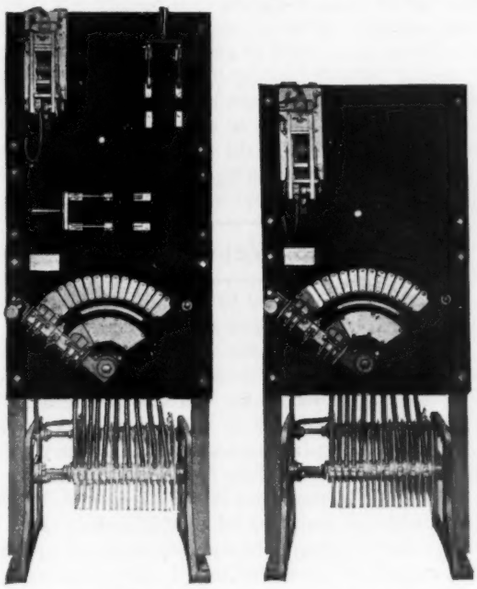
The city of Wilmot, S. D., is operating a municipal lighting plant, and in September, 1907, it installed a battery consisting of 132 cells "Chloride Accumulator," manufactured by the Electric Storage Battery Company, of Philadelphia, with a capacity of 10 amp for eight hours, the jars being sufficiently large to permit increasing the battery capacity later by 150 per cent in order to take care of the natural increase in the day load, the battery having been installed to supply day service during the hours when the steam plant was shut down.

This battery has now been in operation for over 18 months and its installation has resulted in a gross increase in business of from 25 to 30 per cent. The operating expenses of the plant have only increased about 5 per cent and the net receipts for power during the hours when the generating equipment is shut down amount to about 20 per cent of the cost of the battery installation. An additional net revenue has, of course, been secured, due to the increased number of customers, who would not consider electric power unless 24-hour service could be given them.

Consequently, this battery installation has effected a gross return of more than 20 per cent on the battery investment, resulting in a material net return on the battery investment, after allowing for interest and maintenance charges. The battery is valuable as a reserve in case of any temporary derangement of the generating equipment, and has been of assistance in helping out during the peak on frequent occasions when the peak load on the plant exceeded the generator capacity.

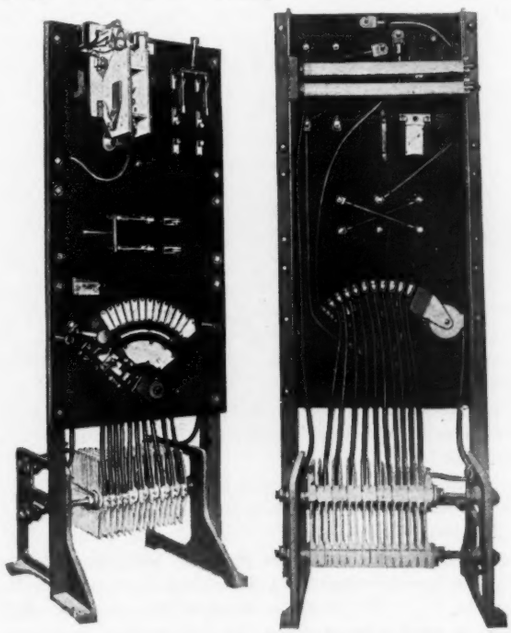
## Self-Contained Motor Starters.

The accompanying illustrations show motor starters of rugged construction recently placed on the market by the Electric Controller & Manufacturing Company, of Cleveland, Ohio. The attempt to interpret the severe operating conditions encountered in mill service has necessarily led to the use of some features not found in earlier motor starters. The starters are



FIGS. 1 AND 2.—MILL-TYPE MOTOR STARTERS.

made in panels, have supporting feet, and are completely self-contained. The dimensions of the different forms vary only in height. In width, nothing projects beyond the slates so that adjacent starters may be placed side by side, thus forming a continuous control board. The starters are furnished in several forms, beginning with a very simple form and elaborated on to



FIGS. 3 AND 4.—MILL-TYPE MOTOR STARTERS.

embrace such features as no-voltage release, overload protection for running, and separate and different overload protection for accelerating. In explanation of the last-named feature, this design allows more current to reach the motor during starting than during running. When a motor is connected to a load having large inertia—such as a hot saw or a press with a heavy flywheel—the mere accelerating of the load demands a very considerable expenditure of work. Since such starting is relatively infrequent, the motor will not be injured by employing a starting current in excess of the running current, while the starting time will be materially reduced. There are, in fact, numerous places where it is desirable to allow an accelerating current larger than the running current.

The danger of a broken or weakened spring return arm is absent, because no spring is used. The no-voltage protection is secured entirely by a magnetic switch which opens upon failure of voltage. This same magnetic switch, in connection with an overload coil, is used for securing overload protection. Since the overload feature must withstand the abuse and have the characteristics of a circuit-breaker, the equipment is designed with the arc-breaking ability of a circuit-breaker.

The following features characterize the operation of this type of motor starter:

1. The magnetic switch can be closed only by bringing the arm to the "off" position, thus preventing injurious overloads to the motor upon the return of voltage after voltage failure.

2. The magnetic switch can be held closed to the arm or any accelerating step only by holding in a push button. This arrangement prevents leaving any of the starting resistance permanently in circuit, and thereby burning out the resistor.

3. The magnetic switch will maintain itself closed only when the arm is at the full-on position.

The resistors, fingers, contacts, etc., used in the motor starters are of the same design and kind of material as used in the company's controllers for heavy service.

## Exhibits at Ohio Electric Light Convention.

At the Ohio Electric Light Association's convention, held at the Boody House, Toledo, Ohio, July 13, 14 and 15, a number of exhibits were made as usual by manufacturing companies. In the following mention is made only of the new appliances recently brought out which were shown there:

The General Electric Company exhibited a new rectifier for charging two-cell or three-cell storage batteries. This rectifier consists of a small compensator and a polarized vibrating make-and-break which vibrates in synchronism with the supply current and delivers a continuous current. It can be connected for either 7.5 volts or 5 volts direct current with 5 amp maximum current. The battery to be charged is connected across the direct-current terminals and the flow of the current can be regulated by means of a rheostat. The whole apparatus is mounted on a slate base very much like a rheostat with the compensator behind. A small ammeter indicates the current.

The new General Electric water heaters shown are on an entirely different principle from the former water heaters and cookers. The heating element is contained in a brass disk which is connected in the bottom of the stand. The utensil screws in the stand and is held firmly against the heating element by means of a Mason jar thread. This makes the washing of the utensil easier, as it is unscrewed from the stand and free from the weight of the heating element, and is also conducive to better life of the element. The element itself has the new ribbon resistance material which is of such high specific resistance that only one layer is used. This company's new coffee percolator and new flatiron also make use of this new resistance material. In the field of illumination the new G. E. intensified arc was shown. The positive electrode consists of two carbons 3/16 in. in diameter feeding down by gravity to their meeting point. The negative lower carbon is large and burns away slowly. This makes it possible to keep the light-giving crater of the arc in a fixed position between trimmings, which in turn makes the use of an efficient reflector possible. The arc is rated at 5 amp.

The Westinghouse Nernst lamp has recently been improved by the use of a zigzag carbon filament for heating the glower. This makes the lamp begin to give light instantly when the current is turned on, and the glower is heated sufficiently to come into action in a short time. This overcomes the objection

to the slow starting of the Nernst lamp which has sometimes been urged against it.

Among the Westinghouse exhibits was a combination outfit whereby a number of household services can be obtained from one motor of 1/20 hp. This motor had connections for polishing and grinding wheels and a flexible shaft for driving other apparatus. This company has just put out a toaster stove for the preparation of breakfast in 15 minutes. With this stove was also shown the Westinghouse electric irons in model form, with plate glass over the heating elements and an incandescent lamp behind the elements to show the construction. This company also has a new electric range very similar in general construction to gas ranges which have the ovens and broilers on top. The Westinghouse 8-in. fans, which were brought on the market this year, were shown. Low-voltage sign lamps in 5-watt, 10-sizes, operated from a special 10-volt economy coil, were also shown.

The Manhattan Electric Supply Company showed a new line of Wesco electric flatirons and a teapot and stove.

## Electric Furnaces.

A novel display of electric furnaces for all classes of chemical work was recently exhibited in the testing rooms of the new plant of the Hoskins Manufacturing Company, Detroit, the occasion being the summer meeting in that city of the American Chemical Society, the visiting members of which made an inspection visit to the Hoskins factory.

Of the many special features of the exhibit the following were of particular interest: A complete connected train of apparatus for determining the carbon content of steel, showing strikingly the advantages of the application of the electric combustion-tube furnace to such steel analyses. The furnace used in this train was run directly from a 110-volt circuit and produced a chamber temperature of 1000 deg. C. (1832 deg. Fahr.) with a current consumption of 6 amp. The ease and accuracy of determining proper temperatures for hardening carbon steels were demonstrated by the Hoskins "Recalescent Outfit," consisting of a standard-voltage, single crucible furnace and a special thermocouple pyrometer. Sample steel specimens, fastened to the couple, were placed in the hot furnace, and on both the heating and cooling of these the "critical" points were readily noted from the pyrometer indicator. A temperature of 1200 deg. C. (2192 deg. Fahr.) was produced and maintained in both crucible and tube furnaces of the heavy-wire wound type. These are for low-voltage operation, with transformer control.

In the furnace-room a permanent installation, with transformer and switchboard, of the Hoskins carbon-plate resistance furnace, was shown. This furnace was in regular operation melting special alloys, being capable of producing a temperature of 2000 deg. C. (3632 deg. Fahr.). In connection with the furnaces a complete installation of Hoskins thermo-electric pyrometers was shown. In each of the operating furnaces was placed a thermocouple, all of these being connected, through a selective switch, to an illuminated dial meter calibrated in Fahrenheit degrees. By turning the switch the temperatures of each of the furnaces were indicated, in quick succession, upon the meter scale.

The inspection of these products, under working conditions, impressed the large number of chemists present from all parts of the country with the increasing importance of the application of electrical energy to all classes of chemical work.

## New 200-250-Volt Tungsten Lamps.

The advantages and economy of the tungsten incandescent over the carbon-filament lamp have been practically denied to most circuits operating at 200-250 volts, because the regular multiple tungsten lamps were designed for the standard voltage of 100-125. On these larger voltage circuits—for example, 220 volts—in order to use tungsten lamps at all it was necessary to operate two 110-volt lamps in series. Most users of the higher voltages preferred to wait for the advent of the tungsten adapted to their voltage.

In answer to this considerable demand, the General Electric Company has extended its production of tungsten lamps into voltages from 200 to 250. This gives to the users of higher voltages the opportunity for the adoption of the economical high-efficiency lamps for multiple service. The regular 200-260-volt carbon-filament lamps ranged in nominal efficiency from 3.8 watts per candle to 3.1 watts per candle. The new tungsten has the usual tungsten efficiency of 1¼ watts per candle actual. The new lamps are claimed to possess all the excellent qualities of the regular General Electric 100-125-volt tungsten lamps, including the same form of specially anchored filaments which make the 100-125-volt lamps so successful. Tests of the new 200-250-volt tungstens show the average life and performance of these lamps to be fully up to that of the standard multiple lamps. The lamps have ratings of 45, 70, 110 and 180 watts.

## Stone & Webster Outing.

The Triskelion Outing, held by the firm of Stone & Webster and its subsidiary corporations on Saturday, July 10, at the Pomham Club, Providence River, was an enjoyable success. The event comprised a round-up of all the Stone & Webster people in the vicinity of Boston to celebrate the official adoption of the "Triskelion," which emblem will hereafter adorn Stone & Webster property throughout the country.

The outing was originated by Mr. Francis J. Hovey, of the Stone & Webster Management Association, who, by the way, is credited with the invention of the "Blue Bell" sign for the Bell Telephone Company. He was ably seconded by Mr. E. F. Flynn, of the management staff, and Engineer Bushnell, of the Engineering Corporation.

The "Triskelion" flag was raised 'mid a vociferous din from the voices of the 300 present, including about 60 lady employees, who were as enthusiastic as the men. Success to the flag was drunk in the form of a Triskelion cocktail especially compounded under the able direction of Mr. Flynn.

Mr. Webster spoke a few words of welcome and set forth the spirit which has always actuated the firm and hoped that the mark of the Triskelion would ever serve to maintain the feeling of loyalty and unity which has formed the foundation of the firm's success. No better evidence of the esteem in which the firm is held by its employees could be shown than the hearty ovation tendered Mr. Webster at the conclusion of his remarks.

Immediately after dinner, athletic exercises were commenced under the guidance of Mr. Edward S. Morse, Chief Engineer Emeritus, the only invited guest, and in spite of his venerable age, the youngest man present. The Japanese tournament run by him bowled over everybody, including at least one dignified member of the firm.

In the senior ball games between the Engineering Corporation and the Securities Department, the former won both games. Vice-President Tripp undertook to umpire, but shouts of "Kill the umpire!" seemed to be about to be heeded and Mr. Tripp's hat was shortly *hors du combat*, whereupon he retired in favor of Equipment Expert Lee Barker. The junior ball game, between the messenger boys and the mailing department, was won by the latter, 5 to 4.

The bowling alley and billiard rooms were well filled, while the ladies divided their time between the dance hall and a steamboat ride on the river.

It was with reluctant steps that the jolly party betook itself to the special train at 5:30 o'clock to return to Boston. Everybody, from Mr. Webster down to the smallest office boy, had had a good time, and the Triskelion Outing of 1909 will fill a large page in the personal history of each. The members of the firm present were: Messrs. Edwin S. Webster, Russell Robb, Henry G. Bradlee and Eliot Wadsworth.

The emblem which gave the name to the outing, and which has recently been adopted by the Stone & Webster Company, consists of a three-arm swastika, called triskelion, within a triangle. The former symbolizes energy and motion and the latter stability.

## Electric Lawn Mower.

A new application of the electric motor is to the lawn mower, as shown by the accompanying illustration. The machine illustrated was devised by Mr. Franklin H. Kerr, of 5969 Union Avenue, Chicago, and the picture shows the apparatus in use on the Capitol lawn at Columbus, Ohio. The machine is driven by a ½-hp electric motor. It is now on exhibition at the Electric Shop, in Chicago, and in this case the motor is of the single-phase, 60-cycle type, turning at 1750 r.p.m. and made by the Century Electric Company, of St. Louis. The machine itself bears the name of the Springfield Electric Mower Company. The motor drives on a countershaft in the rear of the machine, from which both the rear traction wheel for propelling the machine and the revolving grass-cutting blade in front are operated by chain drive.

At Columbus the electric mower was operated by means of 500 ft. of No. 12 duplex flexible cable, and it is said that no difficulty was experienced in cutting the grass on 12 acres without the machine becoming entangled in the cable, which is connected at one end, of course, to a suitable source of electricity. For any ordinary requirement Mr. Kerr says that 250 ft. of flexible cable will be ample. The cable is ordinarily carried on a reel at the handles of the machine. It is asserted that with a little practice the operator will be enabled to use the machine nearly as easily as though there were no cable connection.

In turning and backing away from corners a slight pull on the handles will raise the traction wheel sufficiently so that it will not catch on the ground, and therefore there is no necessity for reversing the motor. A friction safety clutch placed on the sprocket driving the cutting blade throws the latter out of engagement on striking a stone or other obstruction without injuring the blade or driving mechanism. The machine weighs about 100 lb. and makes a 40-in. cut, but the inventor is making plans for a smaller machine to make a 20-in. cut and be driven by a ¼-hp motor for city use. The larger machine, however, is more economical in consumption of electricity in proportion to the work accomplished. It is said to do the work of six men with ordinary lawn mowers.

ELECTRIC LAWN MOWER.

While the electric mower has been operated successfully on the State Capitol grounds at Columbus, according to Mr. William Miller, the superintendent of grounds, doing close and rapid work around trees and shrubs and over driveways, the inventor thinks that the principle of the machine is capable of much greater development. He is building an improved type of machine for farm and garden tillage to be used to operate plows, harrows, drills, seeders and trucks, as well as mowers, and also provided with emery-wheel attachment for grinding and a pulley by which pumps or other stationary machines may be operated. Mr. Kerr thinks that the trend of agriculture in this country is toward smaller farms and more intensive cultivation. Horse farming tools have increased greatly the tillage acreage; but it is thought that the application of electric power on small farms will double the yield at one-half the expense of maintaining horses, with no stabling or operating expense when the machines are not in use. Furthermore, the electric-power machine will be compact, light and simple, capable of being operated up steep grades and over soft ground and more easy to handle in corners or confined spaces than a machine drawn by horses. To make use of this idea, however, the same machine must be adaptable to the various uses of the farm, and electricity for power must be obtainable at a cheap rate.

## Horse Grooming by Electricity.

Mechanical methods for grooming horses have been in use for a number of years, but the electrically operated outfit illustrated herewith is said to represent the latest improvements in this direction. Central-station men will be interested in the machine as indicating a possible method of getting some new business. The apparatus shown is the invention of Mr. John F. Packer, of La Grange, Ill., and is made by the John F. Packer & Sons Company, of the same place, the electric motors used being furnished by the Kimble Electric Company, of Chicago. The motor is flexibly attached to the swinging arm of an overhead crane, as illustrated. To the motor is attached a flexible shaft to which in turn is connected the cleaning brush or clipper knife. A pneumatic attachment is provided so constructed as to utilize the currents of air arising from the rapid rotation of the brush to protect the operator from dust and dirt and to deposit the latter on the floor. The flexible shaft is made of piano wire and is ½ in. in diameter. The cleaning brush is driven by friction so that should the mane or tail of the horse be caught the brush will stop at once without doing damage to the machine.

FIG. 1.—HORSE GROOMING BY ELECTRICITY.

FIG. 2.—MOTOR, FLEXIBLE SHAFT AND BRUSH.

The motors are built particularly for this work. They are of the variable-speed, reversible type, invented by Mr. Austin Kimble and are used on alternating-current or direct-current circuits. If the supply of electricity is direct current, resistance is inserted in the circuit; this is not needed if the current supplied is alternating. The variation in speed is from 100 to

5000 r.p.m. and the operator may stop, start or reverse the machine, run slow or fast, by the use of one lever. The motor is of the four-pole commutator type with commutator control; shifting the brushes controls the speed and power. A full voltage may be impressed in the opposite direction on the motor when it is running at full speed with load. In other words, should the motor be turning at a velocity of 5000 revolutions it will not injure the machine to throw the reverse lever over instantly to full voltage and load in the opposite direction. The frame of these machines and all exposed parts are made of aluminum and brass—a feature of particular value in a livery stable where the ammonia and exhalations will damage anything made of iron or steel.

Many advantages resulting from the use of this horse-grooming outfit are enumerated by the manufacturer. It is said that the machine will clean a horse better than the work can be accomplished in any other way and that anyone accustomed to horses can learn to use the apparatus in a few minutes. The cost of electricity to operate the machine at average rates is said to be about $5 a month for 50 head of horses. The connection to the electric service may be made by means of an incandescent lamp socket. The motors are built to operate on 110-volt or 220-volt circuits. When the machine is in operation it is necessary that one man keep the horse's mane and tail out of the reach of the brush. The danger is not in injuring the machine, but rather of frightening the horse.

## First Annual Electrical Show in San Diego.

The enterprise of the electrical contractors of San Diego, Cal., was well illustrated recently when the Electrical Contractors' Association held an educational show to which the public was freely admitted. Daily demonstrations were made by different firms of heating, cooking, electrical machinery, the whole affair being conducted in a spirit of helpful co-operation and friendly rivalry rather than destructive competition. The booths were of uniform size, 12 ft. x 14 ft., and were artistically decorated. It is estimated that during the one week of the show there were 100,000 visitors. The success of the undertaking was such that during next year the second annual show will be held for two weeks. Credit for this result is due largely to Mr. C. H. Heilborn, of the Southern Electrical Company, who was the chief promoter of the show.

FIG. 1.—MEMBERS OF SAN DIEGO ELECTRICAL CONTRACTORS' ASSOCIATION.

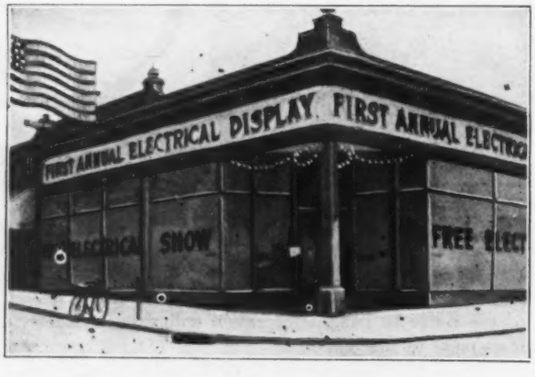



FIG. 2.—ELECTRICAL SHOW BUILDING.

The association is composed of 10 contracting firms: The Hartwell Electric Company, the Southern Electrical Company, the Johnstone Electrical Company, the Woods Electric Company, the Star Electric Company, the Bay City Electric Company, the Clark Electric & Machinery Company, Ayers & Strornton, Shaffer & Moses, C. W. Buker. Among the companies not members of the association but taking part in the show were the General Electric Company, which occupied a booth displaying tungsten lamps; the Thearle Music Company, which furnished music; the Ingersoll Candy Company, which furnished refreshments; the San Diego Street Railway Company, which equipped a rest-room, and the Arnold Vibrator Company, which gave demonstrations with vibrators.

The officers of the Electrical Contractors' Association of San Diego are as follows: President, F. S. Hartwell; vice-president, C. H. Heilborn; treasurer, A. E. Johnstone; secretary, H. C. Ayres.

## Two-Piece Fuseless Wooden Molding Rosette.

Pass & Seymour, Inc., of Solvay, N. Y., have brought out a two-piece molding rosette shown in the accompanying engravings: one of which shows the rosette by itself with the cap in position, and the other showing the rosette mounted on a piece of molding with the cap slightly raised. The device is fuseless and is said to have met the approval of the Underwriters' Laboratories. It will be noticed that the small inside piece with the metal parts is intended to be mounted directly on top of the molding. It is not necessary to cut the wire to do this, since the latter may be looped over the terminal plate at the extreme outside point, going under the head of the upper contact screw. There is said to be ample room in the cap for the knot of the cord and the latter is fastened under the two inside screws on the terminal plates. The rosette is attached to the molding by means of two screws passing through holes in the cap. This makes a very neat and finished job which does not necessitate cutting the molding, and which can be completed in remarkably short time.

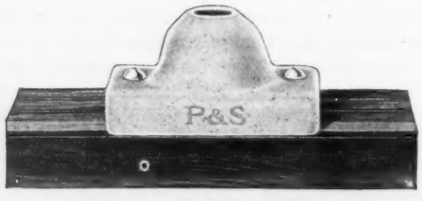



FIG. 1.—MOLDING ROSETTE.

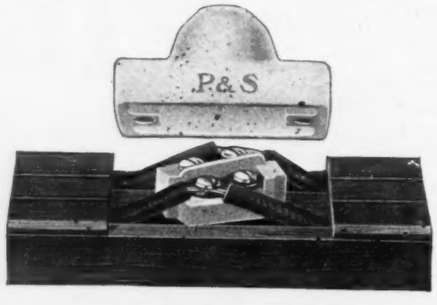



FIG. 2.—MOLDING ROSETTE.

# Industrial and Commercial News

## Commercial Intelligence.

### THE WEEK IN TRADE.

A certain portion of the improvement noted in business is being attributed to the progress made in the work of tariff revision, which has reached its final stage—the possibility of the President's veto still remaining, however. Railroad earnings are 6.3 per cent better than in 1908 and only 0.8 per cent under 1907. Foreign commerce at the port of New York during the latest week aggregated $23,695,475, which is $3,052,683 better than in 1908, but $8,856,574 under 1907. Imports were heavy, but exports less than in the two preceding years. Optimism continues to be the characteristic feature of the markets for iron and steel. Steel bars, plates and shapes are firmer, but despite the higher prices orders continue to be received by the mills. New business in steel rails is light. Bar iron shows improvement. Comparatively large sales of Bessemer pig iron have been made, thus advancing prices, and other heavy transactions are looked for. Sales of ore are increasing, and there are indications that the season's shipments may equal those of 1907, the record year. Copper is lower and demand is dull, but the larger sellers do not appear anxious to sell at prices offered by consumers, who for the most part want bargains. Stocks here have been heavily reduced, but oversea the supply shows a large increase, and at the same time domestic production continues of record volume. With the exception of copper, which is still under the influence of oversupply, consumption is rapidly catching up with production capacity, and the problem is becoming that of meeting orders with adequate dispatch. Business failures for the week ending with July 15, as reported in *Bradstreet's*, were 206, against 182 for the previous week, 215 in the corresponding week of 1908, 177 in 1907, 188 in 1906 and 165 in 1905.

### THE COPPER MARKET.

Throughout the whole of last week the copper market was dull, there being only a few sales largely by speculators, and in a few instances by weak holders. A slight improvement was noticeable on Monday when a sale of 2,000,000 lb. of electrolytic was reported at 13⅛ cents per pound. In general the demand has been very light and mainly in small lots. The large exports have helped the American producers to dispose of some of their surplus stocks. The shipments to European ports last week were the heaviest recorded, aggregating 12,986 tons, and for the first half of July 18,937 tons, or at the rate of nearly 38,000 tons for the month, which would be record breaking, as the largest monthly exports ever made from this country were during December, 1907, when 37,685 tons were exported. The fact that copper is going largely to swell surplus stocks abroad has a depressing effect, although it is reducing the surplus held by producers in this country. During the last two weeks the increase in British warehouses, where stocks are held against standard contracts, has been 8,000,000 lb.: the total British stocks are now a little less than 158,000,000 lb. On the Metal Exchange July 19 quotations were as given in the table.

| | |
|---|---|
| Lake | 13¼ @ 13⅜ |
| Electrolytic | 12⅝ @ 12⅞ |
| Casting | 12½ @ 12¾ |

The London prices, July 9, were as follows:

| | Noon. | Close. |
|---|---|---|
| | £ s d | £ s d |
| Standard copper spot | 58 7 0 | 58 12 6 |
| Standard copper, futures | 59 1 3 | 59 7 6 |
| Market | Steady. | Firm. |
| Sales of spot | | 800 tons |
| Sales of futures | | 1,400 tons |

Extreme fluctuations for this year:

| | Highest. | Lowest. |
|---|---|---|
| Standard | ..... | ..... |
| Lake | 14.55 | 12.55 |
| Electrolytic | 14.25 | 12.12½ |
| Casting | 14.12½ | 12.00 |
| London, spot | £64 2 6 | £54 12 6 |
| London, futures | 64 17 6 | 55 10 0 |
| London, best selected | 67 15 0 | 59 0 0 |

WESTERN ELECTRIC COMPANY.—The volume of the business of the Western Electric Company is said to be running at the rate of $46,000,000 a year, and while this is far short of the results for 1907, it compares favorably with last year, when it amounted to $33,000,000. In 1907 the volume was $53,000,000. This shows an improvement of 40 per cent in the first case and at the rate of 87 per cent of the 1907 record. An official of the company says: "The present business outlook seems to us good, but without anything to lead us to expect an unusual growth in our business. A sure and steady increase, however, may be confidently looked forward to if business conditions continue along the lines they are doing at present. Gross business for the first quarter of the fiscal year ran at the rate of $42,000,000 per annum, and for the last quarter at the rate of nearly $50,000,000 for the year, an increase of about 19 per cent. While the business for May is usually ahead of the business of the preceding months, the increase of May, 1909, over May, 1908, showed approximately 60 per cent. The month of April, 1909, showed an improvement equivalent to 50 per cent over April, 1908, and if the ratio of improvement of the last two months continues the company will easily attain a $50,000,000 volume. The increase in the machinery sales for the half-year was 40 per cent over the same period a year ago. The volume of the company's orders for the six months increased about 30 per cent over the same period in 1908 and the average value per order increased approximately 10 per cent. The company is putting more copper into consumption at present than for a long time. As is the established policy of the company, however, the metal is purchased only for requirements that can be clearly foreseen."

DELAY IN FILLING EXPORT ORDERS.—In a recent report Consul John H. Grout, of Odessa, Russia, says he finds that much trade is lost in Russia by American firms owing to inattention to the desires of purchasers. He cites the following case which has just come to his notice: Odessa has a well-established and growing telephone system. Some time ago the management sent an order to a certain manufacturing firm in the United States for a lot of instruments. The goods were desired at once in order to meet almost immediate demands. Delay succeeded delay in receiving the goods, and it was six months before they arrived, during which time the management was obliged to order from Germany supplies sufficient to provide the most pressing demands. Owing to this lack of attention on the part of the American firm, the local company has decided henceforth to order its supplies from Berlin and of German make. The consul adds that perhaps this incident may serve as a reminder to American houses desiring foreign trade that if they wish to keep or gain it they should be prompt in filling orders.

CONSOLIDATION IN PENNSYLVANIA.—The Delaware County Electric Company has been formed to take over the following properties operating in the suburbs of Philadelphia: The Media Electric Light Company, the Citizens' Electric Light & Power Company, of Clifton Heights, the Faraday Light Company, of Morton, the Philadelphia Suburban Electric Company, of Lansdowne. These properties were themselves a consolidation of several smaller properties, so that the Delaware County Electric Company will be the merger of some 12 companies. The entire physical property of the Delaware County Electric Company will be reconstructed and in conjunction with the Associated Gas & Electric Company will be controlled and operated by W. S. Barstow & Company, of New York. The territory supplied covers about 64 square miles adjoining the city of Philadelphia to the west, and serves a population of about 50,000. It is expected that the physical reconstruction and consolidation will be completed by Sept. 1.

CROCKER-WHEELER COMPANY.—At the July directors' meeting of the Crocker-Wheeler Company, Ampere, N. J., held at the New York office of the company the following officers were elected for the ensuing year: Vice-president, Mr. Gano Dunn; second vice-president, Mr. A. L. Doremus; chief engineer, Mr. Gano Dunn; secretary, Mr. Rodman Gilder; treasurer, Mr. W. L. Brownell; assistant treasurer, Mr. G. W. Bower. Dr. Schuyler Skaats Wheeler continues to hold the office of president.

THE NORTHERN CALIFORNIA POWER COMPANY is building a 24,000-hp hydro-electric plant in the Battle Creek County and the plant will soon be ready to commence operation with the 6000-hp unit. This station, designated "South," is five miles south of the Volta power plant of the company, where 9000 hp is now generated, and immediately south of Manton. The water to obtain power at "South" is taken from South Battle Creek to North Battle Creek, Mill Creek, and from water owned in Rock and Bailey creeks. At the tail-race near the South station, the water is again picked up and carried down South Battle Creek Canyon to a point near where the Red Bluff-Manton road crosses, and here will be constructed another station, to be known as "Inskip," at the foot of Inskip Butte, where 8000 hp will be obtained. On the line between the intake of the ditches from South Battle Creek and the power house several tunnels are being built, the longest being 4000 ft. The company expects to turn the water into South power house for the generation of energy during the present month; and will then continue the units, until all are completed, when they will have a total equipment of 27,000 hp, which should be in service by Nov. 1 of this year. From this point they will go on to main Battle Creek, where the largest unit of all, 24,000 hp, will be installed. All of these installations will be completed by the end of 1910, making in all in that section available horse-power of 51,000.

SOUTHERN PACIFIC ELECTRIFICATION.—On the division of the Southern Pacific, extending for 140 miles over the Sierra Nevada Mountains from Reno, Nev., to Sacramento, Cal., the limit of haulage has already been reached on the one-track road. Estimates indicate that the cutting of new tunnels, and thereby lowering the grades for steam haulage, would cost from $40,000,000 to $50,000,000 and consume eight years, while a change to electric haulage could be made in two years at a cost of $13,000,000. With electric haulage 75 per cent will be gained in speed, and there will be a 20 per cent reduction in non-profitable tonnage on account of the reduction in the weight of equipment. In commenting upon the report that the road would be electrically equipped on a large scale, the director of maintenance and operation, Mr. Julian Kruttschnitt, said: "We have never contemplated using electricity, except where the Sacramento division crosses the mountains, about 110 miles between sea level on the west and the base of the interior plateau. With a grade of 7000 ft. and six or eight passenger trains a day besides heavy freight trains, that section presents a tremendous problem in transportation. However, our new locomotives have demonstrated a capacity for handling 12 per cent heavier trains with far less fuel than two of our former heaviest locomotives." The company has placed orders for 21 Mallet compound oil-burning locomotives, two of which are now in use on the mountain division.

LARGE HYDRO-ELECTRIC PLANT IN MEXICO.—Reports from Mexico state that the Chapala Power & Irrigation Company, which is being organized to combine the Pimental street railway and electric lighting systems, and the valuable water-power, irrigation and transmission concessions of Manuel Cuesta, will construct a 16-mile canal to carry the water of the Santiago River to a point where a fall of 1800 ft. can be obtained for developing 90,000 hp. The proposed canal would extend from the Juanaca Falls of the Santiago River to Las Juntas, where one of the Pimental power plants is now located. At Juanacatlan the Santiago River enters a barranca, and between that point and Las Juntas drops more than 1800 ft. The canal would follow one side of the barranca until Las Juntas was reached. The estimated cost of the canal is $96,000 per mile. The plans now being formulated in connection with the organization of the new company include the transmission of energy to Aguascalientes, Zacatecas, and other cities and towns, and to a number of mining districts.

SOUTHERN POWER COMPANY'S NINTY-NINE ISLAND PLANT.—The Ninety-nine Island plant of the Southern Power Company will be completed by February next. The site is on Broad River, seven miles from Blacksburg, S. C. B. H. Hardaway has the contract for the construction of the plant. The hydraulic equipment of this plant consists of six 5200-hp Allis-Chalmers horizontal twin turbines, which will be directly connected to Westinghouse 2500-volt three-phase generators. The e.m.f will be stepped up from 2500 to 50,000 volts by three banks of 2000-kw transformers. This plant will tie in at Clover, S. C., with the present 50,000-volt system and will also tie in at Spartanburg, S. C., with a 100,000-volt line to Greenville, S. C. The dam at this plant, which is the largest in the South, is now almost completed. The head developed is 72 ft. and the whole dam will contain 160,000 yd. of concrete masonry. This plant is located in the heart of the Piedmont cotton manufacturing district, and the energy will be largely used by mills of that section.

COST OF NEW YORK CITY LIGHTING IN 1903.—The Appellate Division of the Supreme Court has reversed the lower court and granted the appeal of the city of New York, Boroughs of Manhattan and The Bronx, for an order to inspect the books and papers of the New York Edison Company and the United Electric Light & Power Company to ascertain the cost of electricity for lighting purposes and the price charged against the city in 1903. The electric light companies declared that they were furnishing light upon a contract and at a reasonable rate, but the city authorities denied it and moved to find out what the cost was. Justice McLaughlin, writing the decision, said that if it turns out on the trial that the electric light companies never had a contract the plaintiff can recover only the reasonable and fair market value of the electricity furnished, and the city cannot prepare its case for trial unless it can ascertain what it cost the plaintiff to manufacture and deliver.

ROCKY RIVER (N. C.) HYDRO-ELECTRIC PROJECT.—A. H. Richardson and other leading capitalists of Ansonville, N. C., are promoting a project looking forward to the development of an electrical power site on Rocky River, near Wadesboro, N. C. A dam will be built to cost $400,000 and a power house constructed which will have an initial equipment rated at from 6000 to 7000 hp. The line of the new Southbound Railway passes within one mile of the proposed power plant site, and the promoters expect to see a new town and manufacturing center established. With the cheap power generated at the plant it is believed that large cotton mills can be operated at a good profit. The work now being done is obtaining options and the organization of a company for the purpose of securing the capital needed. It is thought that the entire work can easily be done by the enlistment of local financiers.

USE OF HUDSON TUNNELS BY ERIE.—In addition to the Pennsylvania Railroad, which began to send its passengers through the Hudson tunnels on July 19, the Erie Railroad will make use of the same facilities, beginning on Aug. 2. The schedule for the regular operation of trains calls for six minutes for the trip to Manhattan from Jersey City. The six-minute schedule will chop off about 15 minutes of the time it now takes the commuter to get from Jersey City to Church and Fulton Streets in New York. Arrangements have as yet not been made for the use of the tunnels by the passengers of the Delaware, Lackawanna & Western Railroad or by the Lehigh Valley Railroad.

WESTINGHOUSE LOW-PRESSURE TURBINE IN TEXTILE MILL SERVICE.—At the Bernon Mills of the Manville Company, Georgiaville, R. I., a 300-kw Westinghouse-Parsons low-pressure turbine is being installed to take steam at atmospheric pressure from the exhaust of a Corliss engine, driving a three-phase, 60-cycle, 600-volt alternator to supply additional energy for lamps and motors in the mills. The turbine is operated without superheating and exhausts into a condenser maintaining a vacuum of 27 in. The distribution system supplies energy to a synchronous motor directly connected to a mill line shaft.

BOONE (IOWA) ELECTRIC FRANCHISE.—The City Council of Boone, Iowa, on July 8 granted a franchise to Messrs. E. E. Hughes, J. H. McBride and Andrew Stevenson to operate an electric light plant, heating plant and street railway in that city, subject to ratification by the citizens at a special election to be held Aug. 16. It is stated that the above named have secured an option on the present properties of the Boone Electric Company, of which Mr. John Reynolds is president. It is proposed, should the ordinance be ratified, to overhaul the present plant and extend the electric railway to Story City.

NEW YORK CENTRAL TUNNEL.—The New York Central Railroad Company is planning to construct a 670-ft. tunnel at Spuyten Duyvil, to avoid the sharp curve at this point, and to increase the number of tracks from two to four, which will be arranged for electric motive power. The cost of the tunnel will reach $500,000.

WESTERN TELEPHONE MANUFACTURING COMPANY.—The Western Telephone Manufacturing Company, which recently moved its headquarters from Muskegon, Mich., to its new factory at 9 South Curtis Street, Chicago, was established in Chicago in 1893, and lays claim to being the oldest independent telephone manufacturing company in the United States. It maintained its factory in Chicago until 1904, when it moved to Muskegon, returning now to Chicago. There have been some changes in the personnel of the company. Mr. Charles L. Johnson, treasurer, has retired on account of the rapid growth of the business of the American Electric Fuse Company, of Muskegon, which he represents in Chicago. Mr. Horace E. Anderson, general manager, becomes secretary and treasurer of the company, retaining the management also. The president of the company is Mr. Rolland L. Porter, a retired capitalist from Milwaukee. The general policy of the company will remain unchanged, but bringing the general offices and factory together, with a new factory and the installation of new machinery, will enable the company, it is thought, to become an increasingly active factor in the telephone field.

NEW COLORADO ELECTRIC POWER DEVELOPMENT.—It is reported that the Greeley-Poudre Irrigation Company of Colorado is forming a combination power and irrigation project which will include reservoirs involving an expenditure of several million dollars, the construction of many miles of additional canals and laterals for Weld, Laramie and other counties, the higher reservoirs to be used for large electric power developments. The Denver City Tramways, through W. G. Evans and J. A. Beeler, the general manager, is reported to be specially interested in this power proposition, and is to be connected with the Greeley-Poudre Irrigation Company. Several smaller irrigation companies, including the Cache le Poudre Irrigation Company, controlled by W. G. Evans, of the Denver City Tramways, will probably be absorbed in the proposed merger. The entire project is said to be entirely independent of the present large power developments of Colorado.

OUTLOOK IN THE POLE INDUSTRY.—Mr. W. P. Bowring, secretary of C. H. Worcester & Company, pole dealers, 143 Dearborn Street, Chicago, when asked about the outlook in the pole industry, answered that, whereas business is rather quiet just at present, there were considerable fair-sized orders from large consumers earlier in the year. It is believed that there will be an improvement in the pole business this fall, and Mr. Bowring feels quite confident that by next spring there will be a brisk demand for poles from electrical companies, owing to the demands of new electrical construction. Prices for cedar poles have remained unchanged for some time, and Mr. Bowring thinks that the present is a good time to buy them. Telephone companies take poles of varying sizes, ranging from 16 to 50 ft. in length, but the standard trolley and electric light poles are about 35 ft. long.

NEW YORK INDEPENDENT TELEPHONE COMPANY.—The Appellate Division of the Supreme Court has denied the appeal of the New York Independent Telephone Company for permission to place telephone wires under the streets of the city. The higher court affirmed the decision of the special term of the Supreme Court, which denied the application of the Independent company for a writ of mandamus directed to the commissioner of water supply, gas and electricity to issue a permit to lay wires in the conduits. In refusing the appeal Justice Clarke says the New York Independent Telephone Company merged with the Mercantile Electric Company in 1905, and now asserts its right to lay wires under the franchise of a concern organized for a burglar-alarm business.

A LARGE CENTRAL STATION BOILER.—A single boiler of unusual size, 2274 hp, has been placed in the Delray power station of the Detroit Edison Company. This boiler, a Stirling special, has a 150-in. x 11-ft. grate, and is served with bituminous coal by four Roney stokers installed underneath the one boiler. This exceptional installation is in the first section of the Detroit Edison Company's No. 2 power house at Delray, in the construction of which allowance has been made for extending the outfit with similar units as the station's lighting load increases. Mr. George W. Cate is superintendent of the plant. The engineering design and construction were carried out by Westinghouse, Church, Kerr & Company.

LARGE CENTRAL STATION CONTRACTS IN CHICAGO.—Under its new schedules of reduced wholesale rates, the Commonwealth Edison Company of Chicago has recently closed several contracts of large size. One is to supply all the electricity required by the five factories of the Crane Company, with a connected load of about 7000 hp. Another is for the large department store of Siegel, Cooper & Company, with a maximum demand of about 1200 kw. This establishment was supplied with electricity from its own private plant for many years. Another department store which recently began taking energy from the Edison system is Hillman's, with a maximum demand of about 500 kw.

STEAM TURBINE LITIGATION.—The General Electric Company has brought suit in the United States Circuit Court in Buffalo against the city of Dunkirk for an injunction restraining the city from using an alleged infringement of two of its patents on devices used on two Allis-Chalmers turbo-generators in Dunkirk's new municipal electric and power plant; also for an accounting of profits accruing to the city, and recovery for damages to the General Electric Company, resulting from such alleged use. Devices invented by W. L. R. Emmet and O. Junggren are said to be the subjects of the suit. The Allis-Chalmers Company will defend the suit.

ELECTRICITY FOR COTTON MILLS.—Electrical energy obtained from the plant of the Carolina Power & Light Company, at Buchhorn Falls, is now being used for driving the cotton mills at Sanford, N. C. A total of 11,000 spindles and 400 looms, which were formerly run by a 450-hp engine supplied by steam from four 100-hp boilers, are now driven by electric motors. This is the second manufacturing plant in Sanford to use electric power, the ice factory being the first. It is said that others will follow as soon as wiring can be done, the transmission line having been completed only a few weeks ago.

CURTIS TURBINES ABROAD.—The British Thomson-Houston Company has received repeat orders from the Liverpool municipal station and the London Electric Supply Company's station for Curtis turbines. There are now three Curtis turbines in the former and five in the latter. Fourteen orders for turbines have also been received for turbo-generators for collieries and other industrial plants, ranging from 350 to 1500 kw, with one exception, all for alternating current. Some of these machines will utilize the exhaust of reciprocating engines, and others are for "mixed pressure."

BAD PACKING AND DELAY IN FILLING EXPORT ORDERS.—The United States Consul-General at Capetown, South Africa, in reporting on the canning industry of that country quotes as follows from a letter written by a large canning company: "With regard to a possible demand for American canning and drying machinery in this country, although we have ourselves installed it, we have had to pay heavily for it and have suffered immense delays in the delivery of the goods, which, too, have often received severe handling in transit and have arrived damaged."

MONTANA ELECTRIC ROADS.—It is reported that two electric railways are to be constructed from Missoula to Hamilton, Mont., one on each side of Bitter Root River. The line on the west side will parallel the Northern Pacific, while the east line will traverse nearer the center of the valley, and be used exclusively for passenger business between the valley terminals, the other on the west side will be devoted to freight traffic. The lines are to be built by the Chicago, Milwaukee & Puget Sound Railroad. Ex-Senator W. A. Clark is reported to be interested in these projects.

GENERAL ELECTRIC COMPANY.—Improvements which will necessitate an outlay of about $100,000 have been planned for the factory of the General Electric Company at Schenectady, N. Y. An indication of the extent to which workmen are employed in Schenectady is found in the fact that the company is advertising for help in Rochester, Syracuse, New Haven and other places. The prospects for the immediate future are said to be brighter than for several years.

THE MONTANA MORNING MINE & MILLING COMPANY, Troy, Mont., is erecting a 1000-hp hydro-electric station to supply energy to its mines, to the town and to other mines in the neighborhood. The equipment will be increased as the demand for energy increases. It is stated that a total of 25,000 hp can be developed by utilizing all of the water at the maximum available head.

AMERICAN ELECTRICAL WORKS.—The contract for electrical supplies, including fixtures, fittings, lamps, cable, wire, line material, etc., for which bids were opened June 22 at the office of the Isthmian Canal Commission, Washington, D. C., has been awarded to the American Electrical Works, of New York, for $38,842.

HYDRO-ELECTRIC PLANT FOR BOSTON & MAINE.—The Boston & Maine Railroad has purchased from Mr. Alvah W. Sulloway, of Franklin, N. H., the hydro-electric installation privileges at Eastman Falls on the Pemigewasset River. The transaction includes also undeveloped water-power in the same river in the towns of Bristol Hill, New Hampton and Canborton. Boston & Maine officials say that the railroad company has need of electrical energy, inasmuch as it has large shops in the vicinity and also operates trolley lines.

WESTINGHOUSE ACTIVITY.—It is reported that more orders were received at the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company during June than in any other month in the history of the company, the total value of business during that month amounting to $2,500,000. The present operations are now only slightly behind those of the banner year 1907, when business amounted to $35,000,000.

WESTINGHOUSE ELECTRIC ANNUAL MEETING.—The annual meeting of the stockholders of the Westinghouse Electric & Manufacturing Company will be held at East Pittsburgh, Penn., on July 28, at which time four directors will be elected to serve for four years.

## *Financial Intelligence.*

### THE WEEK IN WALL STREET.

As may be inferred from the table below, the United States Steel issues were the center of interest in the stock market. On Thursday the sales of the common stock equalled one-fourth of the total sales made on that date, while on Friday the quotation reached the then high record of 72¾, and rose to 73 on Saturday. It is estimated that the net earnings of the United States Steel Corporation for the quarter ended June 30 will be about $5,000,000 larger than they were for the previous quarter, an increase of about 25 per cent. However, the indications are that the larger transactions in Steel were conducted by banking interests and regular Wall Street traders rather than outsiders. Although most of the stocks are now high, no marked tendencies toward lower prices are in evidence while many facts point toward increases in the stocks that have remained fairly stationary. The securities market as a whole has been strengthened by reason of the satisfactory showing of the steel trade which is regarded in many quarters as a proper barometer of general trade conditions. Railroad earnings continue to increase and bank clearings are gradually enlarging. The total gross earnings of 724 railroads reporting to the Interstate Commerce Commission were 15.37 per cent greater for May, 1909, than for the same month of 1908. Stock quotations on July 19 were as given in the accompanying table.

NEW YORK.

| | July 12. | July 19. | Shares sold. | | July 12. | July 19. | Shares sold. |
|---|---|---|---|---|---|---|---|
| All.-Ch. ..... | 15 | 15¼ | 900 | Int.-Met., pfd. | 48¾ | 47½ | 18,030 |
| All.-Ch., pfd.. | 51¾ | 51⅞* | 920 | Mackay Cos... | 80½* | 81* | 300 |
| Amal. Cop.... | 81⅜ | 81⅞ | 95,800 | Mackay Cos.,p. | 73¼* | 74½* | 200 |
| Am. D. T.... | 29* | 30* | —— | Man. Elev.... | 143⅞* | 147* | 1,605 |
| Am. Loc..... | 60¾ | 61¼ | 4,800 | Met. St. Ry.. | 18* | 20* | 200 |
| Am. Loc., pfd. | 118¼* | 119* | 100 | N.Y. & N.J.Tel | 137* | 140 | 1,810 |
| Am. Tel & Cbl. | 80* | 84 | —— | Steel, com.... | 69⅞ | 71⅞ | 746,000 |
| Am. T. & T.. | 140 | 140⅝ | 16,250 | Steel. pfd.... | 125¾ | 127⅝ | 52,853 |
| B. R. T..... | 78 | 78 | 7,530 | W. U. T..... | 71⅜ | 72¼ | 2,100 |
| Gen. Elec.... | 164½ | 166 | 4,600 | West'h. com... | 85½* | 85 | 6,500 |
| Int-Met., com. | 15½ | 15½ | 8,791 | West'h, pfd... | 121¼* | 124½* | —— |

PHILADELPHIA.

| | July 12. | July 19. | Shares sold. | | July 12. | July 19. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Am. Rys..... | 45½ | .... | —— | Phila. Elec... | 11⅞ | 12 | —— |
| Elec. Co. of A. | 12⅞ | 12⅝ | —— | Phila. R. T... | 29 | 29¼ | —— |
| Elec. St. B'ty. | 52½ | 54¾ | —— | Phila. Trac... | 91 | 90½ | —— |
| E. S. B'ty,pfd. | 49* | .... | —— | Union Trac... | 53 | 53½ | —— |

CHICAGO.

| | July 12. | July 19. | Shares sold. | | July 12. | July 19. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Chi. City Ry.. | 180* | 180 | —— | Chi. Tel. Co.. | 132½* | 132½ | —— |
| Chi. Rs.,Ser.1. | 112¾* | 112 | —— | Met. El., com. | 16½ | 15½ | —— |
| Chi. Rs.,Ser.2. | 40½* | 39 | —— | Met. El., pfd. | 48 | 47 | —— |
| Com. Edison.. | 121½ | 120½ | —— | Nat'l Carbon.. | 92½ | 90 | —— |
| Chi. Sub'ws... | .. | 20 | —— | Nat'l C., pfd. | 120 | 118 | —— |

BOSTON.

| | July 12. | July 19. | Shares sold. | | July 12. | July 19. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Am. T. & T.... | 140¼ | 140⅝ | —— | Mex. Tel..... | 2⅞* | 2¾ | —— |
| Cum. Tel..... | 133½* | 137½ | —— | Mex. Tel., pfd. | 6* | .... | —— |
| Edison E. Ill.. | 250* | 250* | —— | N. E. Tel.... | 133¾* | 133¾ | —— |
| Gen. Elec.... | 164* | 164* | —— | W. T. & T.... | 10½* | 10⅜ | —— |
| Mass. E. Ry... | 13¾ | 13½ | —— | W. T. & T., p. | 87 | 86 | —— |
| Mass. E. R.,p. | 72½ | 74* | —— | | | | |

*Last price quoted.
Shares sold are for week July 10 to July 17.

### DIVIDENDS.

Michigan State Telephone Company, quarterly, 1.5 per cent on common stock, payable Sept. 1; 1.5 per cent on preferred stock, payable Nov. 1.

American Light & Traction Company, quarterly, 15 per cent on preferred stock, payable Aug. 2; 3 per cent on common stock, payable Aug. 2.

Havana Electric Railway Company, 1.5 per cent on preferred stock, payable Aug. 14.

Lowell Electric Light Corporation, quarterly, 2 per cent, payable Aug. 2.

Albany Home Telephone Company, quarterly, 1 per cent, payable Aug. 2.

Columbus Railway Company, quarterly, 1¼ per cent, payable Aug. 2.

Electric Bond & Share Company, initial dividend on common stock, 2 per cent, payable July 15; quarterly on preferred stock, 1¼ per cent, payable Aug. 1.

Minneapolis General Electric Company, semi-annual, 3 per cent on preferred stock and 2 per cent on common stock, payable Aug. 2.

American District Telegraph Company, of New Jersey, quarterly, 1 per cent, payable July 22.

Edison Electric Illuminating Company, of Boston, quarterly, 2.5 per cent and extra dividend of 1 per cent, payable Aug. 2.

Electric Company of America, semi-annual, 3.5 per cent, payable Aug. 3.

Connecticut Railway & Lighting Company, quarterly, 1 per cent on common and 1 per cent on preferred stock, payable Aug. 15.

Commonwealth Edison Company, quarterly, 1.5 per cent on common stock, payable Aug. 2.

Jacksonville Electric Company, semi-annual, 3 per cent on preferred and 3 per cent on common, payable Aug. 2.

AMERICAN TELEPHONE & TELEGRAPH COMPANY.—According to a circular which the American Telephone & Telegraph Company has sent to its stockholders, there were, on July 1, 1909, in the United States about 24,000 telephone companies or lines or systems, having 6,500,000 stations. The Bell system proper, comprising the Bell associated operating companies, has 3,215,245 stations and 7,800 connected independent companies, lines or systems, with 1,150,000 stations, making a total of 4,365,245 stations. In another circular it is shown that the total capital obligations of the American Telephone & Telegraph Company and associated companies are $970,030,200 in capital stock, bonds, real estate, mortgages and bills payable, inclusive of $592,475,400 owned by the public, $56,067,100 owned by associated operating, holding and manufacturing companies, and $321,487,700 owned by the American Telephone & Telegraph Company. The total capital obligations of the Bell system on May 1 last, $592,475,400, are $85,356,900 less than the total property owned, including $547,881,500 as the book value of the entire telephone plant. The total capital obligations of the American Telephone & Telegraph Company taken alone are $369,374,500, which is $56,606,200 less than the company's assets in real property, cash and securities. The property of associated operating companies amounts to $583,195,400, which is $37,485,800 more than the combined capital obligations of these associated operating companies. The company has taken an important step in the direction of consolidating the interest of its subsidiary companies by offering to exchange its shares for New York & New Jersey and for Philadelphia Bell. The stock of the New York & New Jersey Company pays 7 per cent, while the American Telephone & Telegraph Company pays 8 per cent, and the Bell Telephone Company of Philadelphia pays 6 per cent. The offer is for a share-for-share exchange with the New York & New Jersey Company and for seven shares for eight Bell shares with the Philadelphia company.

SOUTHERN CALIFORNIA EDISON COMPANY.—Articles of incorporation have been filed at San Bernardino of the Southern California Edison Electric Company, nearly all of the directors of which are officers of the Edison Electric Company, of Los Angeles. They are: James A. Lighthipe, electrical engineer of the Edison; Edward W. Sax, auditor; Addison A. Maxwell, chief clerk; William Dieterle, deputy superintendent; S. M. Kennedy, general agent; O. P. Schoonmaker and John Otto, of Los Angeles; A. E. Murphy, of Ocean Park. The newly formed company will own and operate the Edison Electric Company, of Los Angeles. We are authoritatively informed that there is no intention of merging the Edison company with the Pacific Light & Power Company, as rumored.

RECEIVER FOR McCALL FERRY PROPERTY.—Mr. J. Edward Aldred, president of the Shawinigan Water & Power Company, Montreal, Canada, has been appointed receiver for the McCall Ferry Power Company, of Pennsylvania, the combined capital stock and outstanding bonds of which aggregate $20,000,000. The papers filed in the district court give the Knickerbocker Trust Company, of New York, as the complainant. In the affidavit it is stated that the company has defaulted in the interest on its outstanding bonds, which number 9027, and are of the par value of $9,027,000. Of this amount the reorganization committee holds $7,775,000 as trustee. The committee consists of William H. Barnum, who made the affidavit; A. C. Bedford, S. Reading Bertron, Charles A. Coffin, and Gardner M. Lane, all of New York. The company was incorporated in Maine about five years ago, and had as its project the erection of a concrete dam, 60 ft. high and a half mile in length, over the Susquehanna River near Columbia, Pa., for the purpose of generating and transmitting electricity. With the dam more than two-thirds completed, the company was forced to suspend work for lack of funds. More than $10,000,000 has been expended on the project, and if the dam were completed it would be one of the largest of its kind in the United States. Efforts were made in New York recently to reorganize the company, but the plans fell through, owing to the opposition of the bondholders. The reorganization plans were to form a new company, to be known as the Southern Pennsylvania Power Company, with an authorized issue of $12,500,000 of 5 per cent bonds and $8,500,000 stock. The bondholders were to get 40 per cent in new bonds and 60 per cent in new stock for their holdings.

SALE OF THE ROCKINGHAM POWER COMPANY.—All properties of the Rockingham Power Company, including the hydro-electric plant at Blewett Falls, on the Yadkin River, near Wadesboro, N. C., machinery, etc., were sold at public auction July 14 at Wadesboro, N. C., by order of the United States Court, to D. H. Thomas, representing the bondholders. The purchase price was $1,000,000, the sale being subject to confirmation by the court. This plant was planned for 12,000 hp, with an eventual capacity for 24,000 hp, the power to be transmitted at 60,000 volts to a number of nearby small towns. Hydraulic and electrical machinery were purchased from the S. Morgan Smith Company and the General Electric Company, and $1,500,000 in bonds were issued, which amount has been spent in the development of the power plant. Liens were filed in the Wadesboro Court aggregating $150,000 for unpaid claims against the company. Trouble in this enterprise dates back to the failure of the Knickerbocker Trust Company, which was financing the enterprise, and later differences arose between Hugh McRae & Company, of Wilmington, N. C., and other stockholders which resulted in litigation culminating in the present sale. The ultimate cost of the completed plant is estimated at $3,250,000. The company had an authorized capitalization of $5,000,000. The plant is located in the heart of the North Carolina cotton manufacturing district, and power was to be sold to cotton mills and other manufactories as well as to towns in that section. It is understood that the plant will be completed at once by the purchasers. The main dam is 1475 ft. long and 50 ft. high. The initial power plant installation consists of 3000-kw generators driven by horizontal shaft waterwheels.

PHILADELPHIA RAPID TRANSIT COMPANY.—Preliminary figures on the business of the Philadelphia Rapid Transit Company for the fiscal year ending June 30 show that the various changes made during the fiscal year resulted in producing an average fare of 3.94 cents per passenger, as against 3.57 cents as the average collection from the 512,869,023 passengers carried during the fiscal year 1907-08. Last year 464,364,656 passengers were carried. The present average fare is 4.18 cents. The receipts for the year were $18,306,000, compared with $18,288,763 for the previous year. There was an increase in earnings of $17,000 in the face of a traffic decreased by more than 48,500,000 passengers over the year before. Figures are not yet available for the costs of maintenance of way, of energy and of general expenses, but the transportation expenses were decreased by about $409,000, having been about $4,413,000, against $4,822,472 for the previous year. Owing to the cost incident to changing some 300 cars to the pay-within type, the maintenance of equipment expenses were increased about $20,000, which would bring the item to about $935,000. It is estimated that the company lost $300,000 by reason of the recent strike.

A NEW SPRECKELS (SAN FRANCISCO) COMPANY.—A company, to be known as the Municipal Light & Power Company, has been organized by Messrs. Rudolph and Claus A. Spreckels, and incorporated at San Francisco. The company is capitalized for $1,000,000, of which $500 has been subscribed, $100 by each of the five directors, who are Rudolph Spreckels, Claus A. Spreckels, Percival S. Scales, J. H. Sandford, and Frank Harrold. The object of the company is to acquire, construct, and install gas and electric plants, and to distribute electricity and gas for domestic and manufacturing purposes. An electric light plant, known as the Spreckels plant, has been in operation for some time at Jessie Street, near Third Street.

KIMBLE ELECTRIC COMPANY.—The capital stock of the Kimble Electric Company, of 324 West Washington Boulevard, Chicago, has been increased from $10,000 to $50,000. This company, under the technical direction of Mr. Austin Kimble, the vice-president, manufactures a type of variable-speed, single-phase, reversible motor that has attracted much attention, and the business, although in existence only a year or so, has shown remarkable expansion. Mr. James K. Bass has entered the company as treasurer, and will attend to the office end of the business, relieving Mr. Kimble of that responsibility. Mr. Kimble will devote his entire attention to the factory, supervising the design and production of the motors.

SALE OF ROME (N. Y.) TELEPHONE PROPERTY.—The property of the Rome Telephone Company has been sold by the bondholders at foreclosure sale. The plant was built in 1900 from the proceeds of the sale of $150,000 of 5 per cent mortgage bonds. The property was bid in by James S. Brailey, of Toledo, Ohio, acting for the bondholders, for $20,100. The plant will be rebuilt and an automatic system will be installed.

## REPORTS OF EARNINGS.

| | Gross earnings. | Expenses. | Net earnings. | Charges. | Surplus. |
|---|---|---|---|---|---|
| **Dallas (Tex.) Electric Corporation:** | | | | | |
| May, 1909 | $103,525 | $66,183 | $37,342 | $26,839 | $8,503 |
| May, 1908 | 90,459 | 64,063 | 26,396 | 39,938 | *3,542 |
| **Galveston-Houston Electric Company:** | | | | | |
| May, 1909 | 103,603 | 58,731 | 44,872 | 21,420 | 23,452 |
| May, 1908 | 91,023 | 54,701 | 36,322 | 19,740 | 16,582 |
| **The Minneapolis General Electric Company:** | | | | | |
| May, 1909 | 84,673 | 37,340 | 47,333 | 19,670 | 17,663 |
| May, 1908 | 73,677 | 36,662 | 37,015 | 31,222 | 5,793 |
| **Northern Texas Electric Company:** | | | | | |
| May, 1909 | 104,899 | 57,847 | 46,952 | 17,189 | 29,763 |
| May, 1908 | 83,807 | 54,856 | 28,951 | 16,553 | 12,398 |
| **Seattle Electric Company:** | | | | | |
| May, 1909 | 457,258 | 264,459 | 182,799 | 103,315 | 79,484 |
| May, 1908 | 386,961 | 215,858 | 170,103 | 88,432 | 82,671 |
| **Denver Gas & Electric Company:** | | | | | |
| June, 1909 | ..... | ..... | 72,836 | 34,841 | 37,955 |
| June, 1908 | ..... | ..... | 59,473 | 32,001 | 24,472 |
| Year ending June 30, 1909 | 2,299,182 | 1,300,623 | 998,559 | 392,147 | 606,412 |
| Year ending June 30, 1908 | 2,062,326 | 1,210,171 | 852,155 | 378,601 | 473,554 |
| **American Light & Traction Company:** | | | | | |
| June, 1909 | 238,171 | 9,649 | 228,522 | ..... | ..... |
| June, 1908 | 189,835 | 4,000 | 185,835 | ..... | ..... |
| Jan. 1 to June 30, 1909 | 1,546,979 | 53,787 | 1,493,192 | ..... | ..... |
| Jan. 1 to June 30, 1908 | 1,217,426 | 24,000 | 1,193,426 | ..... | ..... |
| Year ending June 30, 1909 | 3,052,616 | 74,787 | 2,052,616 | ..... | ..... |
| Year ending June 30, 1908 | 2,535,819 | 36,562 | 2,499,257 | ..... | ..... |
| **Aurora Elgin & Chicago Railroad Company:** | | | | | |
| May, 1909 | 133,028 | 71,356 | 61,672 | 28,549 | 33,123 |
| May, 1908 | 119,048 | 62,769 | 56,278 | 28,422 | 27,856 |
| Eleven months ending May 31, 1909 | 1,316,430 | 724,795 | 591,634 | 308,794 | 282,890 |
| Eleven months ending May 31, 1908 | 1,275,515 | 704,279 | 571,236 | 306,145 | 265,091 |

*Deficit.

# GENERAL NEWS

## Construction News.

DADEVILLE, ALA.—It is stated that arrangements are being made by Henry J. Jones, of Montgomery, Ala., for the formation of a company, whose purpose will be to construct a hydro-electric plant on the Tallapoosa River, near Dadeville. The construction of a 120-ft. dam and the development of 50,000 hp are contemplated.

DOTHAN, ALA.—The city will vote on Aug. 9 on the issuance of $6,000 of bonds to be used for the extension of the electric light system, the recent election having been declared illegal. J. B. McCrary & Company, Empire Bldg., Atlanta, Ga., have been engaged to prepare plans and supervise the work.

MAMMOTH SPRINGS, ARK.—The Mammoth Springs Electric & Power Company, of which Napoleon Hill, of Memphis, Tenn., is owner, contemplates the construction of a dam and power house a few miles from Mammoth Springs, for the purpose of generating electrical energy for transmission to Koshkonong, West Plains and other towns in southern Missouri, as well as to Salem and Hardy, Ark. The company, which has recently installed an electric light plant at Mammoth Springs, is also considering the construction of an electric railway, connecting that city with Thayer, Mo. and Salem, Ark.

CHICO, CAL.—L. A. McIntosh and T. H. Barnard, of this city, have become interested in the location of power plants on Mill Creek. These gentlemen, it is understood, have recently acquired possession of a valuable site on Mill Creek, which is to be developed at an early date. Associated with them is Leon Bly, of Red Bluff.

CRESCENT CITY, CAL.—The Smith River Electric Company, which has offices at 404-405 Balboa Building, San Francisco, and which was incorporated for the purpose of utilizing the water-power of the Smith River for the generating of electrical energy in Del Norte and Humboldt Counties, is planning the construction of two power plants.

DOWNIEVILLE, CAL.—Reports are current that the Four Hills power house, which was recently leased by J. R. Van Fleet and associates, is soon to be rebuilt, and that an entire rehabilitation of the system is to be effected.

FULLERTON, CAL.—The Sunset Telephone Company is planning to expend about $10,000 in the reconstruction of its system in Fullerton and the surrounding country.

GLENDALE, CAL.—An ordinance providing for the issuance of $60,000 of bonds, to be used for the construction of a new municipal light plant, on which the citizens voted on June 22, has been taken up by the City Council and has passed the first and second reading.

LOS ANGELES, CAL.—It is stated that the Board of Public Works will receive sealed bids up to July 30 for furnishing to the city three 100-hp induction motors.

NEVADA CITY, CAL.—The Middle Yuba Hydro-Electric Power Company has decided to commence work at once on its projected power plant on the Middle Yuba River, and within 80 days will be supplying power to the mines at Allegheny, Forest City, Graniteville and the Washington mining districts. The plant will have a minimum output of 3000 hp and a maximum output of 7500 hp.

OAKLAND, CAL.—The installation of 129 electroliers on Sixteenth Street, from Broadway to the Sixteenth Street Depot, is being urged by the West Oakland Improvement Club.

RED BLUFF, CAL.—Work on the installation of a power plant on Mill Creek is soon to be commenced by the Butte & Tehama County Power Company, which has opened offices in Red Bluff.

REDONDO, CAL.—It is stated that the trustees of this city have recommended a new lighting system in the business section. The recommendation specifies the installation of about 2000 incandescent lamps.

ST. HELENA, CAL.—Information comes to us from G. S. Conner, secretary of the St. Helena Gas & Electric Company, that a transmission line through the Napa Valley is to be constructed. The proposed line will cover a distance of about 18 miles, and will take in the towns of Calistoga, Graniteville, Veterans Home, Rutherford and Oakville. Since June 15 the St. Helena company has been purchasing power from the Snow Mountain Water Power Company.

SAN FRANCISCO, CAL.—It is reported that Eastern capitalists have negotiated for the purchase of all of the holdings and rights of the Central Counties Power Company, the Central Counties Land Company and the Yolo Consolidated Water Company in the Clear Lake region.

SANTA ANA, CAL.—A franchise to erect a line of poles and wires up Santa Ana canyon to the Riverside boundary line, for the transmission of electrical energy, has been sold to the Edison Electric Company, the consideration being $100.

COLORADO SPRINGS, COL.—During a severe electrical storm at this city the power plant of the Colorado Springs & Interurban Company was struck by lightning and one of the generators put out of commission.

LAS ANIMAS, COL.—The Las Animas Electric Light Company has just completed its new combination ice and electric light station.

MONTROSE, COL.—The city is contemplating the installation of an Underwriters' standard centrifugal fire pump of 1000 gal. to 1500 gal. capacity as a reserve and additional source for the general water supply, and especially for assurance of proper fire protection. The plant is to use 2300-volt, 3-phase motor direct.

YUMA, COL.—Application for a franchise to construct an electric railway over the streets of Yuma has been filed by Messrs. Karr, Kester and Speese, the line to be operated in conjunction with their proposed Colorado River Railway.

ANSONIA, CONN.—Plans are being considered for lighting Riverview Park by electricity, petitions requesting such service having been submitted to the Park Commissioners.

SOUTH NORWALK, CONN.—Advices are received from the City of South Norwalk Electric Works, which is a municipal plant, that the enlargement of its generating and distributing system is contemplated, it being highly probable that a storage battery for peak loads will be installed. The officials are also ready to consider preliminary information and data relative to the construction of a tunnel under the Norwalk River for electric cables and pipes, the same to be built ready for service, if possible, this year. A. E. Winchester is general manager and superintendent.

WASHINGTON, D. C.—Application has been made by Elliott Woods, superintendent of the Capitol, to the local authorities for the construction of a pumping station in Garfield Park, in connection with the station which supplies heat and light to the Senate and House office buildings.

WASHINGTON, D. C.—As a result of reports submitted by Electrical Engineer W. C. Allen, the adoption of plans to improve street lighting within the city proper and recommendations to Congress for appropriations to put them into effect are to be urged upon the District Commissioners by Commissioner Macfarland when the annual estimates are in course of preparation.

WASHINGTON, D. C.—The following are the totals of bids opened July 10 at the office of the Bureau of Yards and Docks, Navy Department, for one 1000-kw and two 1500-kw turbo-alternators at the Navy Yards, New York, Philadelphia and Boston (Specification 1644): Westinghouse Machine Company, New York, N. Y., $64,750; General Electric Company, Schenectady, N. Y. (two bids), $77,417 and $76,008; Allis-Chalmers Company, Milwaukee, Wis., $61,736.

ATLANTA, GA.—The Central Georgia Power Company is planning to remove its headquarters from Macon to Atlanta, the reason assigned for this change being the larger field offered for the distribution of its product, it being the company's purpose to suply electricity to the large manufacturing concerns in the latter city. It is stated by President W. Jordan Massee that the proposed water power development on the Ocmulgee River and the erection of transmission lines on steel towers into Atlanta will represent an expenditure of $3,500,000. A franchise has also been granted to the company in Griffin.

ROME, GA.—The Rome Railway & Light Company, of which H. J. Arnold is superintendent, advises that about two additional miles of electric railway are to be constructed.

SAVANNAH, GA.—Many improvements in its Montgomery Street plant are to be made by the Savannah Lighting Company. There is to be installed at an early date one 2000-kw turbine engine, additional boilers and other up-to-date machinery. It is thought that the company is seriously considering the construction of a trolley line between Savannah and White Bluff and other towns south of the city.

VALDOSTA, GA.—Bonds are reported to have been sold to be used as follows: $15,000 for water works improvements and $10,000 for electric light plant.

ELK CITY, IDAHO.—Reports are being circulated to the effect that the Idaho Buster Mining Company is looking for a power site on one of the streams near Elk City with a view to installing a power plant. There is also a rumor that the new power plant will be owned by two companies, the Buster and the Golden Crown, which are closely connected through Philadelphia capitalists.

NAMPA, IDAHO.—Arrangements have been entered into between S. D. Gates, representing the General Electric Company at Portland, and the Dewey Electric Light & Power Company, of Nampa, for an installation of the luminous arc system of lighting in the latter city.

CHICAGO, ILL.—A new $100,000 substation on the North Side of the city is to be erected by the Commonwealth Edison Company, a site for same having been purchased some days ago. The plant, work upon which is to be commenced at once, will supply light and power to the section in which it is located, including the new St. Clair manufacturing district.

ELLIOTT, ILL.—The Dix Telephone Company is considering the advisability of increasing its capital stock to $25,000 for the purpose of installing a new exchange at Gibson City.

FAIRFIELD, ILL.—At a recent meeting of the business men of Fairfield and Burnt Prairie plans were considered for the construction of an electric road from Carmi to Fairfield, through Burnt Prairie, a distance of about 25 miles. It is stated that George Brown, of the Burnt Prairie Bank, is one of the prime movers in the enterprise.

RIVER GROVE, ILL.—The Leyden Light & Power Company, which does an electric light and power business in Franklin Park and River Grove, suburbs of Chicago, has been purchased by the North Shore Electric Company.

ST. ELMO, ILL.—The St. Elmo Light, Ice & Storage Company expects to establish a day service. B. E. Muma is general manager of the company.

KNIGHTSTOWN, IND.—It is understood that the City Council has authorized the trustees of the municipal water and light plant to purchase two additional dynamos and other machinery for the light and power department.

SULLIVAN, IND.—Application has been made by the Terre Haute, Indianapolis & Eastern Traction Company for permission to furnish electric lighting in the city of Sullivan. The applicant promises to make the same rates that the city has been paying to the Sullivan Lighting Company for the past two years.

BOONE, IA.—A franchise is reported to have been granted to E. E. Hughes, J. H. McBride and Andrew Stevenson for the operation of an electric light plant, street car line and heating plant.

COUNCIL BLUFFS, IA.—The Citizens' Gas & Electric Company, of which H. A. Holdredge is general manager, is erecting a new substation.

LEON, IA.—The Leon Electric Company, successors to the Leon Electric Light, Heat & Power Company, advises that it is planning to change its system from direct current to alternating current in the near future. The owners of the plant are Samuel C. Johnson, manager, and J. F Smith, superintendent.

TOPEKA, KAN.—A new telephone line from this city to Lincoln, Neb., is being constructed by the Kansas Telephone & Telegraph Company.

WICHITA, KAN.—Plans are being considered by the Wichita Railroad & Light Company, of which W. R. Morrison is superintendent, for the construction of a new power house. It is believed that several hundred thousand dollars will be expended by the company in the improvements contemplated in its system.

ALEXANDRIA, LA.—It is stated that a vote will be taken Aug. 17 on the issuance of $40,000 of bonds, the proceeds to be used for the extension of the electric light and water plant, and the installation of new machinery in the power house. I. W. Sylvester is city engineer.

TALLULAH, LA.—J. E. Craig, city engineer, advises that contracts for the electric lighting plant machinery (bids opened July 10) have been awarded as follows: Engine, Harrisburg Foundry & Machinery Co., Harrisburg, Pa.; electric equipment, Ft. Wayne Electric Works, Ft. Wayne, Ind., and pumps to Platt Iron Works, Dayton, Ohio.

THIBODAUX, LA.—Preparations are being made by Ellis Braud's Sons for the installation of an up-to-date electric light plant for their three Main Street stores.

EAST ORLAND, MAINE.—The Penobscot Bay Electric Company, which has a power plant at this city, and which is furnishing service at Bucksport, Prospect and Stockton Springs, has petitioned for pole locations in the town of Searsport and the city of Belfast.

ROCKVILLE, MD.—Owing to a disagreement with the Town Council concerning its proposed franchise in this city, the contracts for lighting service which the Potomac Electric Power Company, of Washington, has entered into with the citizens of Rockville are being held in abeyance pending an amicable adjustment of the matter.

BEVERLY, MASS.—Permission, for which it applied recently, to furnish electricity for light, heat and power in Topsfield has been granted to the Beverly Gas & Electric Light Company.

BOSTON, MASS.—It is believed that a sale by A. W. Sulloway, of Franklin, N. H., to the Boston & Maine Railroad of water rights and privileges along the Pemigewasset River points to the electrification of the Bristol, Franklin and Tilton, and the Tilton and Belmont railroads. The transfer to the railroad includes the estate, dam, water wheels and all privileges and easements on the east and west banks of the Pemigewasset River at Eastman Falls in Franklin. There are also conveyed estates with rights of flowage and undeveloped water powers at or near Bristol, and in the towns of New Hampton and Sanbornton; all the water power and mill rights formerly owned by the Pemigewasset Electric Company at Eastman Falls, and the rights of flowage acquired by the Pemigewasset Power Company and conveyed to the Pemigewasset Electric Company.

LAWRENCE, MASS.—In order that it may be able to supply power for an additional mill which is being erected, the capacity of the central power plant of the Arlington Mills at this city is to be doubled. Eight new boilers of an aggregate capacity of 5000 hp are to be installed.

MARLBORO, MASS.—The Marlboro Electric Company is installing 67 tungsten lamps of 40-cp in Southboro.

MIDDLEBORO, MASS.—The Municipal Gas & Electric Plant of this city, of which G. A. Philbrook is superintendent, is considering the recommendation of the residents of Warrentown that electricity be substituted for the present system of lighting at that place.

MOUNT HERMON, MASS.—Work has been commenced on the addition to the central power plant of the Mount Hermon School fo Boys, which will include a new boiler house, dynamo room, etc., and will cost about $20,000. The H. Wales Lines Company, of Meriden, Conn., has the contract.

SPRINGFIELD, MASS.—It is reported that the County Commissioners have received a petition from A. A. Langewald for approval of plans and specifications for two dams to be constructed across the Willimansett Brook, in Chicopee.

WORCESTER, MASS.—The City Council has granted a 28-year franchise to the Connecticut River Transmission Company, limiting its privilege to serving power to firms using 15 or more kilowatts.

NEGAUNEE, MICH.—An ordinance has been passed by the City Council granting to the Cleveland Cliff Iron Company a franchise for the construction and maintenance of an electric transmission line within the city limits.

NORTHFIELD, MINN.—Plans having been completed by Edward P. Burch, engineer, Minneapolis, Minn., for a heating and lighting plant for Carleton College, the estimated cost of which is $30,000; bids will be received until July 28 for the construction of same by Harlan W. Page, secretary, Board of Trustees of the College.

CHARLESTON, MO.—We are advised by the Southeast Missouri Ice, Light & Power Company, of which J. C. Crenshaw is secretary and treasurer, that a transmission line to another town is now in course of construction.

ST. JOSEPH, MO.—Fifty new arc lamps are to be added to the city's street lighting system, the board of public works having recently placed an order for that number.

PLAINS, MONT.—It is understood that the Board of Freeholders has granted an electric light franchise to the Plains Light & Water Company, in which J. M. Keith and S. R. Inch, of Missoula, are interested in the enterprise.

BROKEN BOW, NEB.—Announcement is made that John W. Early, of Columbus, Neb., has been granted a franchise to install an electric light plant at Broken Bow.

COLUMBUS, NEB.—It is reported that all necessary details have been completed to assure the construction of the Loup River power plant at Columbus with an output of 50,000 hp and a secondary plant at Schuyler with an output of 30,000 hp. It has been intimated that W. L. Church, president of the Ambursen Hydraulic Construction Company, of Boston, Mass., will be able to let sub-contracts for the preliminary construction work by Oct. 1.

MALMO, NEB.—A special election is to be held in this city, July 27, for the purpose of voting on a proposition to issue bonds for the establishment of a lighting and heating system.

OMAHA, NEB.—About $25,000 is to be expended by the Omaha Electric Light & Power Company in improvements this year, which will include the establishment of a new substation at South Omaha. S. E. Schweitzer is secretary and treasurer of the company.

PIERCE, NEB.—The Pierce Electric Light Plant, formerly the property of Herbert Craven, has been acquired by S. F. Gilman. The new owner proposes to remove the plant to a mill which he operates at this city, and where sufficient water power is available to operate both the mill and the electric light plant. A larger engine and a new dynamo are to be installed.

RENO, NEV.—An option has been exercised by W. P. Hammon and a party of California capitalists on the complete interests of the Reno Power, Light & Water Company, which operates a trans-Nevada system. Mr. Hammon assumed control on July 1.

WONDER, NEV.—According to J. B. Daniel, of the Nevada Wonder Mine, plans are under consideration for the erection of a 300-hp plant at Fallon to supply electricity for lighting the mines, and power for the operation of the mill which is to be constructed on the company's property at Wonder.

ALBANY, N. Y.—An application has been made by the Hoosic River Electric Light & Power, a subsidiary company of the Schenectady Power Company, to the Second District Public Service Commission for a franchise in Valley Falls, Rensselaer county. The Hoosic River Company, whose intention is to handle whatever power is distributed to municipalities or individual users along the transmission line, expects to furnish light to Johnsonville and to take over the present lighting system in Schaghticoke, James O. Carr, of Schenectady, and George E. Green, of Hoosick Falls, appeared for the applicant.

BATH, N. Y.—A day service in this city is promised by the Bath Electric & Gas Light Company, in anticipation of which many business houses are planning the installation of electric motors.

BINGHAMTON, N. Y.—It is announced that the Binghamton Railway Company will expend about $50,000 for improvements on its State Street power plant, which will include the installation of a turbine, new boilers and new condensing apparatus.

BINGHAMTON, N. Y.—A merger has been effected of the Merchants' Telephone Company, the Tunkhannock & Wyoming Valley Telephone Company and the Montrose Telephone Company. The new concern, which is to be known as the Merchants' Telephone Company, and which is capitalized at $500,000, will control the operation of lines in Wilkes-Barre,

Scranton, Tunkhannock, Binghamton and a number of other cities. Many improvements and extensions in the system are planned.

BUFFALO, N. Y.—The Cataract Power & Conduit Company, it is reported, is having plans prepared by Consulting Engineer E. D. Pith, Niagara Falls, Ont., for a $100,000 brick and steel addition to its power house at Niagara Falls.

BUFFALO, N. Y.—The Buffalo General Electric Company has been granted permission to issue its first refunding 5 per cent gold bonds to the amount of $242,000, the proceeds of which are to be used in placing wires underground and in buying new machinery.

DUNKIRK, N. Y.—The Municipal Electric Light Plant announces a reduction in prices of electrical energy for lamps and motors, the basic rate for the former being 7 cents per kw-hour, and for the latter 2½ cents. The minimum charge on lamp circuits is 50 cents per month, and on motor circuits $1.25. The sliding scale of discounts on lighting circuits ranges from 5 per cent up to 10 kw to 20 per cent over 500 kw. On power circuits the rate for energy over 500 kw is 1¾ cents.

LOWVILLE, N. Y.—The Black River Telephone Company contemplates the construction of toll lines in Lewis, Jefferson, Oswego and Oneida counties, as well as the installation of about 1000 new telephones.

NIAGARA FALLS, N. Y.—The Niagara Falls Electric Light & Power Company has announced that its rate in the future for street lighting in this city will be $65 a year instead of $52.

NICHOLVILLE, N. Y.—The Nicholville Electric Light Plant contemplates the construction of about two miles of transmission line. R. C. Chambers is manager.

OSWEGO, N. Y.—Through a recently consummated deal the Citizens' Lighting Company has passed into the hands of H. C. Warren & Company, of Springfield, Mass., the purchase price being $71,820. A new company is to be formed, and it is understood that John C. Knight, the organizer of the Citizens' Company, is to be vice-president and resident manager of same.

SYRACUSE, N. Y.—The Syracuse Lighting Company has been given authority by the Public Service Commission to execute a trust deed for $2,500,000 and issue bonds to the amount of $143,000, the proceeds of which are to be used for the extension and betterment of its system.

TROY, N. Y.—It is announced at this city that the Schroon River Pulp & Paper Company is soon to commence work on a new dam to replace the old one at its plant on the Schroon River at Burnhamville.

KINSTON, N. C.—It is stated that the city will vote on a $50,000 bond issue, the proceeds to be used for extending the water and electric lighting systems.

SALISBURY, N. C.—It is expected that work will soon be resumed on the $10,000,000 plant of the Whitney Power Company, which for a year past has been in the hands of former Congressman John S. Henderson, of this city, as receiver.

ANSONIA, OHIO.—It is stated that an electric lighting system is soon to be installed at this city, the energy being secured from the Greenville Electric Light & Power Company's plant at Greenville.

BRYAN, OHIO.—The Fort Wayne & Toledo Railway Company, which is planning to construct a line from Fort Wayne, Ind., to Bryan, Ohio, has applied for a franchise in the latter city. R. T. Bastress, of Harlan, is general manager of the company.

CLEVELAND, OHIO.—It is reported that the right-of-way for an electric railway to extend between Cedar Point and Rye Beach, near Huron, which will connect with the main line of the Lake Shore Electric Railway, has been secured by Charles Phelps, former superintendent of the Cleveland Electric Railway Company.

COLUMBUS, OHIO.—It is stated that the officials of the Columbus Railway & Light Company have filed an acceptance of the ordinance recently passed fixing the maximum rate for electric lights at 7 cents net per kw-hour for a period of five years.

LEBANON, OHIO.—A number of 80-cp and 40-cp tungsten lamps are being substituted in certain streets of Lebanon in place of the 16-cp and 32-cp lamps.

ARDMORE, OKLA.—Engineer W. T. Forsythe, of West Chester, Pa., writes that the proposed power plant to be constructed on the Washita River, in connection with the construction of the railway, will cost about $5,000,000. Nothing definite has yet been done. Oscar Ayres is interested in the proposition.

BLACKWELL, OKLA.—Plans are being prepared by Burns & McDonnell, of Kansas City, Mo., for the proposed extensions and improvements to the electric light plant and water works, for which the citizens recently voted an issue of $25,000 of bonds.

DURANT, OKLA.—The Southwestern Engineering Company, of Oklahoma City, is preparing plans for the the city electric light plant, to provide for which an election was recently held in Durant to vote on a $20,000 bond issue. W. S. Shannon is city clerk.

OKEMAH, OKLA.—Bids will be received until Aug. 5 at the office of P. J. Becker, Town Clerk, for furnishing material and installing water works and an electric light plant, as follows: Two tubular boilers, one steam engine, an alternating current dynamo, one motor, two power pumps, tower and tank, pipe line, valves, pole and line wire, street lamps, etc. M. A. Earl & Company, Muskogee, are engineers.

POND CREEK, OKLA.—It is the intention of the Jefferson Power & Improvement Company, recently organized, to utilize the waters of Salt Fork and Pond Creek for the development of electrical energy, which is to be supplied to the manufactories of Pond Creek. A dam is to be constructed and a power station erected at that point. It is estimated that about 2500 hp can be developed.

EUGENE, ORE.—The citizens of Eugene are reported to have voted an amendment to the city charter authorizing the Council to acquire real estate water rights and rights-of-way for water works and an electric light plant.

LEBANON, ORE.—The Lebanon Paper Mills expect shortly to commence work on a large dam just above the falls.

NEW PINECREEK, ORE.—We are advised by the California & Oregon Light, Heat & Power Company that it is its intention to supply day power and a motor service next year. W. H. Shirk is manager of the company.

PORTLAND, ORE.—It is stated that the Wasco County Electric & Water Power Company is soon to commence the construction of an electric railway from Portland through Clackamas to the Doschutos river, where a power plant is to be installed that will develop 60,000 hp.

TOLEDO, ORE.—The City Council has granted a franchise to H. L. Collins, A. C. Smith and J. F. Stewart for the erection and maintenance of an electric light plant in this city. The company will later operate a cold storage plant.

BLUE RIDGE SUMMIT, PA.—Negotiations have been entered into between Charles S. Gardner, of this city, and the officials of the State sanatorium at Sabillasville, whereby the excess energy generated at Sabillasville will be utilized for lighting purposes in Blue Ridge Summit. The Sabillasville authorities have signified their willingness to install adequate machinery to generate any additional supply needed.

HAZLETON, PA.—A consolidation has been effected of the properties of the Consumers' Electric Light & Power Company, the McAdoo Electric Company, the Harwood Electric Power Company. the Nescopeck Township Electric Company, Sugarloaf Township Electric Company, the Black Creek Township Electric Company and the Kline Township Electric Company. The new concern is to be known as the Harwood Electric Company.

LEWISBURG, PA.—It is understood that Messrs. Whittaker and Diehl, of Harrisburg, who are interested in the syndicate which recently acquired control of the Lewisburg, Milton & Watsontown Passenger Railway and the Milton Electric Light & Power Company, also own a franchise for a new electric light plant in Lewisburg. An up-to-date power house is to be built in that city within a year.

OAKMONT, PA.—A contract has been entered into between the Crane-Best Company, which is building a plant at Oakmont, and the Allegheny County Light Company, of Pittsburgh, whereby the latter will furnish 2500 hp for the driving of electric motors, cranes, air compressors and for general lighting purposes at the new plant. Power is to be brought by the light company over a heavy transmission line from the Rankin power station.

WAYNESBORO, PA.—The transmission lines of the Waynesboro Electric Light & Power Company are being extended so as to furnish a lighting service to a number of residences at Pen-Mar.

PROVIDENCE, R. I.—Work has been commenced on the power house on Blackstone Boulevard for the Butler Hospital, of which Dr. G. Alder Blumer is superintendent.

CHESTER, S. C.—Bids will be received at the office of W. A. Latimer, Jr., City Treasurer, until Aug. 3 for turbine pumps, motors, valves and electrical equipment.

COLUMBIA, S. C.—The City Council will, on Sept. 7, pass on a franchise allowing entry into the city of the Southern Power Company. The Columbia Electric Street Railway, Light & Power Company has refused to sell its property at the figure offered by the Duke interests, and will contest the grant of the proposed franchise. Features of the situation are claims made by the Southern Power Company that the odd frequency of the present plant—40 cycles—handicaps motor applications, and that the stock of the local company is owned in the North.

MILBANK, S. D.—It is stated that application for a franchise to construct and maintain an electric light plant in Milbank has been filed with the City Council by Oscar Claussen, of St. Paul, Minn.

KNOXVILLE, TENN.—The East Tennessee Telephone Company is arranging to place its wires in conduits on certain streets of this city.

ORANGE, TENN.—The Orange Telephone Company, whose plant was recently sold for $12,000 under a decree of the court to the bondholders, has been reorganized, with H. M. Shingle as manager.

AMARILLO, TEX.—The Amarillo Water, Light & Power Company, of which F. A. White is secretary and manager, contemplates the installation of one 200-kw producer gas engine and generators.

BROWNWOOD, TEX.—The Brownwood Gas & Electric Company expects to rebuild its light and power plant, the new equipment to include twin internal combustion engines of 400-hp capacity, and an equal steam power plant.

GREENVILLE, TEX.—Bids will be received until July 27 by Jos. F. Nichols, Mayor, for the following equipment for the electric lighting and power plant: Two 300-hp water-tube boilers, horizontal or vertical; one 300-kw and one 200-kw, 2200-volt, three-phase, 60-cycle alternators

with independently driven exciters, switchboard and all equipment, complete; one 14-in. centrifugal pump direct-connected to a 75-hp motor and a 75-kw hp direct-connected to a 14-in. pump. J. W. Maxey Company, Houston, Tex., is the engineer.

AMERICAN FORK, UTAH.—The Utah Light & Power Company, which also gives a lighting service to Lehi and Pleasant Grove, is installing a new power plant in the Alpine canyon under the direction of James O. Bullock.

NORTON, VA.—The City Recorder writes that J. B. Sterrett, of Norton, has secured a franchise for an electric light plant in this city, and is in the market for machinery, etc.

BELLINGHAM, WASH.—A permit to construct a power plant on Thunder Creek, where it flows into the Skagit River, about 40 miles above Marblemount, is reported to have been granted to the Thunder Creek Transportation & Smelting Company by the Forestry Department of the U. S. Government. The purpose in erecting the plant is to secure power with which to develop the mines of the North Coast Mining & Milling Company at the head of Thunder Creek, and to operate a railroad which it is proposed to build, right-of-way for an electric line up Thunder Creek to its source having already been secured. It is expected that work on the plant will be commenced this summer.

HOQUIAM, WASH.—A five-year franchise has been granted to the Pacific States Telephone Company at this city. It will place its wires underground in the business section of the city, the estimated cost of the work being $10,000.

ODESSA, WASH.—It is probable that the Town Council will grant to the Washington Water Power Company, of Spokane, permission to establish a lighting system in Odessa. It is estimated that the cost of constructing the transmission line and installing the lighting system in Odessa will be about $50,000.

PESHASTIN, WASH.—It is stated that the Valley Power Company's plant at this city is to have its capacity doubled, which will furnish the city of Cashmere a voltage of over 16,000, and will also aid in many new pumping projects throughout the southern portion of the county.

TENINO, WASH.—The Tenino Light & Water Company is constructing a new plant, in which is to be installed a 120-kw General Electric generator, so we are informed by G. C. McClellan, of that company.

WAITSBURG, WASH.—Many improvements are being made in the plant of the Waitsburg Electric Light Company, including the installation of a 150-hp Corliss engine.

KINGWOOD, W. VA.—The Bell Telephone Company is planning to install a new exchange in this city, and to construct lines to Terra Alta, Rowlesburg, Tunnelton, Newberg, Independence and a number of other towns. It is expected that about $10,000 will be spent on the proposed work.

MARTINSBURG, W. VA.—It is stated that John W. Dodd, of this city, is planning the erection of a power plant on the South Branch of the Potomac, near Romney, to develop electric power for lighting and for the use of manufacturing plants.

GRAND RAPIDS, WIS.—It is reported that the Electric & Water Company has decided to issue bonds for $30,000, the proceeds to be used in rebuilding the electric light lines and installing new switchboards.

JANESVILLE, WIS.—The Edgerton Electric Light Company, of which T. O. Howe is president and W. T. Pomeroy manager, is now controlled by the Janesville Electric Company, which has been supplying it with electricity for some time. The Edgerton company has surrendered its franchise and taken an indeterminate permit under the Public Utility law.

MILWAUKEE, WIS.—It is reported that the R. J. Preiss Company is soon to let contracts for the two 80-hp boilers, engine and generator for use in the new power plant which is to be installed in the factory building it intends to erect in this city.

MONTELLO, WIS.—The Montello Granite Company, of which Lynn S. Pease is general manager, is planning the improvement of its water power plant, the installation of a larger dynamo and the establishment of an all-night and day service.

PETERBOROUGH, ONT., CAN.—It has been practically decided by the city to offer the Central Ontario Power Company $50,000 for the power privileges at Burleigh Falls. The company is now asking $125,000, and should the above offer not be accepted other negotiations for the disposition of the power will probably be entered into by the company.

PORT ARTHUR, ONT. CAN.—The City Council has decided to buy out all the holdings of the Bell Telephone Company at this place for $3,500, this being the last of the Bell companies in Canada west of the Great Lakes.

WEYBURN, SASK., CAN.—The Weyburn Machine Electric Light Company, of which George V. Reed is manager, contemplates the erection of three miles of transmission lines and the installation of an additional boiler.

NICHOLASVILLE, KY.—The city of Nicholasville is figuring on the installation of a new boiler this fall, and it is quite probable that the Nicholasville municipal light plant will be combined with the proposed water works system. This item appeared incorrectly in our issue of July 15 under date of Nicholas, Ky.

ANTIGO, WIS.—The Antigo Electric Company, which expects to change its system from direct to alternating current, is also planning the erection of a new power station, in which are to be installed new boilers and engines. It is, in fact, the intention of the new owners to practically rebuild the plant, the work involving an expenditure of about $60,000.

## Company Elections.

GRASS VALLEY, CAL.—At a recent meeting of the Middle Yuba Hydro-Electric Company the following officers were elected: A. D. Foote, president; W. H. Martin, vice-president; A. H. Tickell, secretary; L. M. Hancock, C. M. Wilson, L. N. Wagner and Dr. Carl P. Jones, directors.

MONMOUTH, ILL.—The following directors have been elected by the Monmouth Telephone Company: A. W. Pattee, Fred Pattee, F. E. Harding, C. C. McClung, J. E. Lanphere, J. E. Watson, R. Lahann, H. B. Smith and W. J. McQuiston.

FITCHBURG, MASS.—The new officers of the Fitchburg Gas & Electric Light Company are: Charles H. Tenney, president; A. B. Tenney, first vice-president; D. E. Manson, second vice-president; H. P. Sands, general manager; Palmer York, treasurer; E. A. Bradley, assistant treasurer; H. A. Gidney, auditor, and Clifton R. Hayes, local manager.

CLAREMONT, N. H.—The following officers and directors have been elected by the Claremont Railway & Lighting Company: W. L. Mauran, of Providence, president; Thomas E. Steere, Providence, treasurer; L. N. Wheelock, manager; directors, W. L. Mauran, H. R. Beckwith, John T. Emerson, Frank H. Foster, Oscar B. Rand and Thomas E. Steere.

WINCHESTER, VA.—The Winchester & Washington City Railway Company has elected the following officers and directors: President, Lewis F. Cooper, Winchester; vice-president, Charles Mullikin, Boyce; secretary and treasurer, Shirley Carter; directors, L. F. Cooper, C. Mullikin, E. V. Weems, W. H. Baker, A. Moore, Harry Warden, S. L. Hoover, R. H. Chew and R. C. Williams.

## New Industrial Companies.

THE ATLAS ENGINEERING & CONSTRUCTION COMPANY, Wilmington, Del., has been incorporated, with a capital stock of $10,000, by George G. Steigler, William M. Lupton and Harry A. Pierce, all of Wilmington.

THE FRED NOLTE COMPANY, Catskill, N. Y., has been incorporated to do an electrical contracting business, its capitalization being $5,000. The incorporators are: Julius Nolte, Leopold Fuerther, Anton Weidman, of New York City.

THE HYDRAULIC CLUTCH DRIVE COMPANY, Wilmington, Del., capitalized at $100,000, has filed articles of incorporation. Those interested are: John L. Johnson, William P. Hartley and Milton A. Kettler, of Washington, D. C.

THE GILLIS-STRICKLAND MOTOR COMPANY, Rochester, N. Y., has been incorporated with an authorized capital stock of $25,000. The incorporators are: James W. Gillis, Pittsford, N. Y.; S. M. Havens, Rochester, N. Y., and R. H. Strickland, Rochester, N. Y.

THE IMPERIAL MOTOR VEHICLE COMPANY, New York, N. Y., has been incorporated with a capital stock of $10,000 to manufacture motors, engines, etc. The incorporators are: Charles S. Baeder, Gilbert W. Mead, New York, and H. E. Tunnell, Cranford, N. J.

THE GLOBE AIR LIFT PUMP COMPANY, New York, N. Y., has been incorporated to manufacture air lift pumps, motors, etc. It is capitalized at $500,000, and the incorporators are: J. A. Rose, William Whelpley, New York, N. Y., and Frank E. Griffin, Albany, N. Y.

THE ANDERSON WINDING MACHINE COMPANY, Jersey City, N. J., has been incorporated to manufacture electromagnets, motors, dynamos, electrical machinery, etc. It is capitalized at $50,000. The incorporators are: H. Sutcliffe, W. O'Connor, C. E. Fisk, all of Jersey City.

THE EASTERN MOTOR CAR COMPANY, Portland, Me., capitalized at $500,000, has filed articles of incorporation, and contemplates the manufacture of motors, automobiles, etc. The following officers have been elected: G. L. Weymouth, president; C. L. Breedy, treasurer, and P. J. Larrabee, clerk.

THE AUTO SAFETY SPECIALTY COMPANY, Buffalo, N. Y., whose purpose is to manufacture electrical and mechanical appliances, has filed articles of incorporation. Its capital stock is given as $100,000, and those interested are: C. B. Fish, J. S. Tucker and M. M. Richardson, all of Buffalo.

THE BOGART GAS POWER ENGINEERING COMPANY, Buffalo, N. Y., has been incorporated for the purpose of manufacturing motors, electrical goods, etc. It is capitalized at $25,000, and the incorporators are: S. A. Ginsburg and J. A. Venable, of Buffalo, N. Y., and B. Ginsburg, of Detroit, Mich.

THE TITAN ENGINE COMPANY OF AMERICA, New York, N. Y., has filed articles of incorporation, its purpose being to manufacture motors, engines, etc. It has an authorized capital stock of $3,000. Among the incorporators are: Nathaniel Doyle, G. W. Garland, Jr., both of New York, and J. J. Hogan, Westhaven, Conn.

J. LIVINGSTON & COMPANY, New York, N. Y., have filed articles of incorporation, and intend to engage in the electrical engineering and contracting business. The new concern has a capital stock of $50,000, and the incorporators are J. Livingston, Jr., Howletts, L. I.; J. G. Livingston, Woodmere, L. I., and F. W. Cooper, New Rochelle, N. Y.

## New Incorporations.

MARKED TREE, ARK.—Articles of incorporation have been filed by the Marked Tree Telephone Company, and the following officers elected: President, E. Ritter; vice-president, W. L. Pfleger; secretary and treasurer, W. B. Avera.

MONTEREY, CAL.—The Monterey & Del Monte Heights Railway Company has been incorporated, with a capital stock of $100,000, and the following officers elected: H. R. O'Bryan, president; George W. Phelps, vice-president; A. G. Metz, secretary and treasurer, and F. M. Fairchild, San Francisco, general manager.

SAN JOSE, CAL.—Articles of incorporation have been filed by the Peninsular Railway Company, which is the successor to the Peninsular Railroad, San Jose & Los Gatos Interurban Railway and the Santa Clara Interurban Railway. It has a capital stock of $12,000,000, and the incorporators are: J. T. Burke, Paul Shoup, C. B. Seger, P. F. Dunne and F. E. Chapin.

KILLINGLY, CONN.—A new power company has been granted a charter to operate in this city. The company will start business with a capital stock of $5,000, which may later be increased to $10,000. The incorporators are Timothy E. Hopkins, Frederick A. Jacobs and George S. Brown.

COEUR D'ALENE, IDAHO.—Articles of incorporation have been filed by the Coeur d'Alene Current Motor Company, which plans to generate and distribute electrical energy for all purposes. The company is capitalized at $250,000, and among those interested are: J. R. Novers, F. E. Wonnacott and Guy Searles.

CHICAGO, ILL.—The Illinois Lakes Light & Power Company has been incorporated with a capital stock of $2,500 to operate a light, heating and power plant. The incorporators are: Thomas H. Robinson, L. W. Bestel, L. F. Mason. G. A. Ellingson, Chicago, Ill., is also interested in the company.

TAMPICO, ILL.—The Tampico Farmers' Mutual Telephone Company, which is capitalized at $10,000, has filed articles of incorporation. Among the incorporators are E. A. Emmons, Charles W. Foy and L. Lutens.

DECKER, IND.—Articles of incorporation have been filed by the White River Valley Telephone Company. The capital stock is placed at $10,000, and the following directors have been elected: J. F. Breithaupt, D. N. Lane and Richard Ready.

MAYFIELD, KY.—The West Mayfield Telephone Company has been incorporated with a capital stock of $4,000, and contemplates the installation and operation of a telephone system in West Mayfield. W. T. Rozzell, of Pryorsburg, and others are interested in the project.

PORTLAND, ME.—Articles of incorporation have been filed by the Cumberland County Light & Power Company, of Portland. It has an authorized capital stock of $300,000, and the incorporators are: C. E. Mitchell, Oakleigh Thorns, New York; Charles G. Fitts, Brattleboro, Vt.; George A. Goodwin, Newell T. Fogg, F. J. Allen, Sanford.

DETROIT, MICH.—Articles of incorporation have been filed by the Home Telephone Company of Michigan. The new corporation comprises the property of the Home Telephone Company, of Detroit, and the Interstate Telephone Company. The capitalization is placed at $5,000,000, and the incorporators are W. A. Jackson, John M. Dwyer and Fred T. Moran, of Detroit, and Maurice F. Bayard, of St. Louis.

MARENISCO, MICH.—The Marenisco Telephone Company has been organized to construct a telephone line from Wakefield to Dunham and Marenisco. Arrangements for long-distance connections have been made with the Bell Company at Wakefield.

KALISPELL, MONT.—The Home Telephone Company, capitalized at $10,000, has been incorporated by C. J. Bain and others.

VINELAND, N. J.—The Maurice River Electric Company has been incorporated, with a capital stock of $100,000, by M. Fry, R. W. Moffat and W. W. Walls, Vineland, N. J., its intention being to generate and distribute electricity.

BUFFALO, N. Y.—The Niagara & Lake Erie Power Company, of Buffalo, has been organized to develop and distribute electricity for light, heat and power purposes in the towns in Erie, Cattaraugus and Chautauqua counties. It has a capital stock of $100,000, and the following directors have been elected: Charles F. Blair, M. J. Binkley and A. F. Tideswell, all of Buffalo.

JOHNSBURGH, N. Y.—The North Creek Electric Company of this city has been incorporated for the purpose of constructing an electric light, heat and power plant. It has an authorized capital stock of $25,000, and the incorporators are: Charles S. Wood, John H. Wade, Charles S. Wade, all of North Creek.

WILLISTON, N. D.—Articles of incorporation have been filed by the Williams County Farmers' Mutual Telephone. Its capital stock is placed at $10,000, and among those interested are: W. W. Keltner, W. W. Wilde and A. Miller, all of Minot.

ARCADIA, OHIO.—The Arcadia Mutual Telephone Company has been incorporated by A. L. Anderson, Sherman Huffman, G. W. Dick and others.

NEW BURLINGTON, OHIO.—Articles of incorporation have been filed by the New Burlington Mutual Telephone Company of this city. It has authorized capital stock of $5,000, and the incorporators are Walter N. Lackey and others.

STOCKHOLM, OKLA.—The Stockholm & Southwestern Telephone Company of Redout has been incorporated, with a capital stock of $2,000, to construct a telephone line from Stockholm to Cupid and Doby Springs. The incorporators are: J. W. Williams, H. W. Allen, H. P. Omo and G. L. Nesbitt, of Redout; A. Gardener, of Cupid, and J. A. Anderson, Oklahoma.

VINITA, OKLA.—Articles of incorporation have been filed for the Craig County Telephone Company, with a capital stock of $10,000, by E. W. Leforce, Matthew Field, of Estelit; W. J. Hendge, W. H. Klaus and E. M. Smith, of Vinita.

HILLSBORO, ORE.—Articles of incorporation have been filed for the Hillsboro Water, Light & Power Company with a capital stock of $40,000 by A. John Stephenson, Charles E. Lyle and W. G. Hare.

SALEM, ORE.—The Independence, Siletz & Pacific Railway Company has filed articles of incorporation, with a capital stock of $500,000. The company proposes to construct an electric railway from Simpson through Siletz Indian Reservation to the coast. The incorporators are: O. M. Taylor, D. N. Sears and H. Hirschberg.

ASHERTON, PA.—The Asherton & Augustaville Telephone Company has been incorporated with a capital stock of $5,000.

BELLEFONTE, PA.—The Clinton Telephone Company has been chartered with a capital stock of $15,000 and the following directors: N. E. Robb, of Harrisburg, Pa., treasurer; W. D. Zerby, J. J. Bower, S. K. Woodring, all of Bellefonte, Pa.

CLARION, PA.—Application for a charter is to be made by G. E. Arnold, R. M. Werner, T. S. Arnold and others for a new company which is to be known as the Clarion & East Brady Electric Railway Company.

HARRISBURG, PA.—Charters have been issued to three electric companies in Schuylkill County. They are the Blythe Township, Middleport and New Philadelphia Electric Light, Heat & Power Companies, each with a capital stock of $5,000. John Pfeiffer, of Tower City, is treasurer of all three companies.

HARRISBURG, PA.—The application for a charter for the Finleyville Southern Railroad Company has been approved. The company is capitalized at $84,000, and proposes to operate an electric railway in Washington County. The directors of the company are: H. B. Hayden, president; J. E. Hayden and S. C. Wilson, of Monongahela; A. E. Hayden, of Finleyville; T. M. Hayden, of Castle Shannon; A. H. Henderson, of Venetia; George Englert, of Pittsburgh, and J. R. Hayden, of Muncie, Ind.

LOCK HAVEN, PA.—The Clinton Telephone Company has filed articles of incorporation with a capital stock of $15,000.

REEDSVILLE, PA.—The Milroy & Reedsville Telephone Company, which proposes to install a telephone system in Mifflin County, has been incorporated with a capital stock of $10,000, and A. R. Gibbony, of Reedsville, elected president.

SALISBURY, PA.—The Mountainville Telephone Company has filed articles of incorporation for the purpose of operating a telephone system in Salisbury. The incorporators are: Charles H. Stoneback, C. Frank Newcomer, of Coopersburg; George F. Carter, of Emaus; Charles E. Erney and others.

WAYNESBURG, PA.—The Interstate Interurban Railway Company has been chartered to construct an electric railway in West Virginia and Pennsylvania. It has an authorized capital stock of $8,400, and the incorporators are: W. J. Sheldon, McKeesport, Pa.; J. C. Sheldon, Buffalo, N. Y.; T. H. Shannon, R. B. Blair and R. B. Chaleroi, Waynesburg, Pa.

PIERRE, S. D.—The Iowa & Omaha Short Line Railway Company has been formed for the construction of an electric railway from Des Moines to Council Bluffs and Omaha, a distance of 140 miles. The capital stock of the company is placed at $1,000,000. The headquarters of the company will be located in Pierre, S. D., and a business office will be operated at Walnut, Ia. John A. Holmes, of Pierre, S. D., is interested in the enterprise.

CLIFTON, TEX.—Articles of incorporation have been filed by the Clifton Electric Light & Power Company, of this city. It is capitalized at $25,000, and the incorporators are: J. H. Chambers, W. G. Scarff and A. A. Slaughter.

TOYAH, TEX.—Articles of incorporation have been filed by the Toyah Telephone Company. It is capitalized at $7,500, and the organizers are A. G. Van Horn, D. P. Van Horn and J. V. Gage.

VELASCO, TEX.—Articles of incorporation have been filed by the Brazos Telephone Company. It is capitalized at $10,000, and the incorporators are D. A. Todd, C. J. Mackey and L. T. Mackey.

WACO, TEX.—Articles of incorporation have been filed for the Texas Central Telephone Company, with a capital stock of $6,000, by M. H. Lane, G. G. Davidson and W. D. Molear.

HELPER, UTAH.—Articles of incorporation have been filed by the Helper Western Electric Railway Company, its purpose being to construct an electric railway from the Denver & Rio Grande Railroad at a point two miles southeast of Helper, through Carbon County. It is capitalized at $15,000, and the incorporators are T. F. Williamson, Salt Lake City, President; C. L. Crandall, vice-president; H. B. Tyrrall, Provo, secretary and treasurer; G. W. Higgins, Clinton, Ind., and J. A. Thorne, Springfield.

BESSIE, VA.—The Russell-Prater Railway Company has been incorporated and contemplates the construction of an electric railway 12 miles long in Dickenson County. It has an authorized capital stock of $25,000, and the incorporators are: Leon Isaacson, Brooklyn, N. Y., president; C. M. Crawford, Ironton, Ohio, secretary; J. E. Hager, B. E. Whitman and C. F. Hager, Ashland, Ky.

WARWICK, VA.—Articles of incorporation have been filed by the Marlinton & Cloverlick Mutual Telephone Company. It is capitalized at $1,125, and the incorporators are John A. Beverage, Clover Lick; A. N. Barlow and George W. Allen, of Warwick.

VANCOUVER, WASH.—Articles of incorporation have been filed by the Clark County Railway Company. It is capitalized at $150,000, and the incorporators are Bert Yates, J. W. Sifton, O. C. Spencer, James G. Kidwell, Walla Walla; J. H. Murphy, A. Welch, C. E. Moulton and O. C. Spencer.

GREAT CACAPON, W. VA.—The Hydro-Electric Developing Company has been incorporated for the purpose of developing the water-power of the Great Cacapon River. It is capitalized at $100,000, and the incorporators are: Wm. B. Osler and Morris A. Orndorff, both of Great Cacapon; Sam'l R. Boyer, Hanover, Pa., and Wm. F. Disher, Berkeley Springs, W. Va.

PARKERSBURG, W. VA.—The Parkersburg & Pocatiligo Valley Railroad has been chartered, with a capital stock of $5,000. The incorporators are C. P. Craig, E. C. Goodno and Joe Williams, of St. Mary's, and R. E. Bills and John W. Dudley, Jr., of Parkersburg.

ALTO (P. O. WAUPUN), WIS.—The Eastern Alto Telephone Company has been chartered, with a capital stock of $4,000, by William Smits, John Frerick, Garry Wellhouse and R. Kastein.

MICHEL, B. C., CAN.—The Michel Water, Light & Power Company has been incorporated to do business in this town.

FORDWICH, ONT., CAN.—The Springbank Telephone Company has been incorporated with a capital of $10,000. The directors are: J. McLaughlin, R. Ferguson, J. Padfield,, all of Fordwich.

## Legal.

LIGHTNING CONVEYED BY TELEPHONE WIRE—NOT NEGLIGENT FOR COMPANY TO FASTEN WIRES TO TREE.—The user of a telephone was struck by lightning and injured while in the act of carrying on a conversation over the line. There was no storm at the place where the accident occurred, but the bolt of lightning was the result of a storm in progress at a considerable distance. A judgment was given for the plaintiff in his action against the telephone company for damages. But, on an appeal, this was reversed and a new trial ordered. It appeared at the trial that, whereas it was customary to make a ground connection with the telephones belonging to the defendant company, in this instance the instrument which the plaintiff was using had no such connection. The wires running from the telephone, instead of being fastened to a pole, were attached to a tree 60 ft. high, standing near the house. There was evidence to show that the lightning struck the tree and traveled over the telephone wire into the house. A witness for the plaintiff, without giving reasons for his opinions, testified that "it was supposed to be dangerous" not to have a ground wire, and that the attaching of a telephone wire to a tree "was not supposed to be the right way." Several witnesses on behalf of the company, one of them being an electrical engineer, testified that it had formerly been the practice to use ground wires in connection with private telephones, but that experience had demonstrated that these ground wires afforded no protection in electrical storms, and their use was discontinued and other safety appliances used. These witnesses also testified that fastening telephone wires to a tree did not increase the danger from lightning, and that an ordinary telephone pole was as liable to be struck by lightning as a tree, and that, when the object to which the wire was attached was struck, the lightning would be carried along the wire to the point of least resistance, wherever that might be. In the opinion of the court the evidence was insufficient to establish negligence on the part of the company, either with respect to the failure to install a ground connection or the fastening of the wire to the tree. For this reason the judgment was reversed. Rural Home Telephone Company vs. Arnold, Court of Appeals of Kentucky, 113 S. W., Rep. 811.

## Personal.

MR. D. O. DARNELL has been succeeded in the management of the Golden Electric Lighting Company, of Golden, Col., by a former owner and manager, A. Morrill.

MR. H. THURSTON OWENS will shortly sail for Europe on a short trip, partly for recreation and partly to note the state of development of illuminating engineering abroad.

MR. CHARLES H. WORCESTER, president of C. H. Worcester Company, pole dealer, Chicago, recently operated on for appendicitis, has made a complete recovery, and is again giving his attention to business affairs.

MR. CHARLES E. CANADA, who since his graduation from Yale has been in the General Electric testing department at Schenectady, will take up commercial work with the Hendrie & Bolthoff Manufacturing & Supply Company of Denver, Col.

MR. C. G. TARKINGTON, formerly of the engineering department of Kohler Brothers, Chicago, has joined the engineering staff of the Westinghouse Electric & Manufacturing Company. Mr. Tarkington's specialty is printing-press control.

MR. P. G. GOSSLER, who has recently become associated with A. B. Leach & Company, is now making his headquarters at their offices, 149 Broadway, New York City. A large number of important plants and enterprises are already receiving his attention.

MR. J. BRODIE SMITH, vice-president and general manager of the Manchester (N. H.) Traction, Light & Power Company, and treasurer of the Brodie Electric Company, was married July 14 to Miss Charlotte Dodd Stewartson, M. D., at the summer residence of the former on Uncanoonuc Mountain, N. H.

MR. R. L. THAYER, well known to the electrical men of the West, has been appointed Western representative of Hanlon & Wilson, Wilkinsburg, Pa., with office at Room 201, 275 La Salle Street, Chicago. Hanlon & Wilson manufacture "Vak Klean," a high-class vacuum-cleaning outfit, which, although new, is attracting attention.

MR. A. E. JOSSELYN, who is in charge of the department of information of the Edison Electric Illuminating Company, of Boston, has been visiting other cities to examine methods of central-station administration in the branch in which he is particularly concerned. He was in Chicago recently, and was much interested in the manner in which the bureau of information of the Commonwealth Edison Company is conducted.

MR. M. L. NEWMAN and Mr. Alfonse Kaufman have formed a partnership for practice as consulting and industrial engineers, with offices at 26 Broad Street, New York, under the firm name of M. L. Newman & Company. Mr. Newman, the senior member, has had a long experience in government work at the Brooklyn Navy Yard. Mr. Kaufman recently severed his connection as manager of the Alaska Chemical Company to become associated with Mr. Newman.

SIR CLIFTON ROBINSON has moved his London office to the Hamburg Amerika Building, 15 Cockspur Street, Charing Cross, S. W., as the old quarters have become the site for new government offices. In a recent article, the *War Office Times* praises Sir Clifton warmly for the active and farsighted interest he has taken in the mobilization and handling of large bodies of troops by means of electric roads, and points out the value of his advice in regard to the extension of such a system.

MR. ROBERT W. MARTIN, a famous old war-time telegrapher, and once in charge of the foreign service of the United Press, was stricken with apoplexy some three years ago while employed on the *New York Herald*, and is now critically ill. His friends and admirers are making an effort to raise funds for the benefit of his wife and daughter in this emergency, so as to enable them to make the best of a trying situation. Mr. Walter P. Phillips, of Bridgeport, Conn., has taken the matter up actively. Contributions to the fund can be sent to Mr. John B. Taltavall, *Telegraph Age*, 253 Broadway, New York City, as a member of the committee.

MR. R. F. SCHUCHARDT has been promoted from the position of engineer of electrical construction to that of electrical engineer in the organization of the Commonwealth Edison Company, Chicago, succeeding Mr. Peter Junkersfeld in the latter position. Mr. Schuchardt graduated from the University of Wisconsin in 1897, with the degree of bachelor of science in electrical engineering, and he has made his mark in the electrical industry of Chicago by the value of his work. For a time after graduation he was associated with Mr. F. B. Badt, but in 1898 he entered the service of the Chicago Edison Company, and for a number of years was connected with the testing laboratory of that company. Mr. Schuchardt is a member of the American Institute of Electrical Engineers and other electrical societies, and in 1901 he was president of the old Chicago Electrical Association. He is a man of scientific and literary tastes, and is editor of the *Edison Round Table*, published by the Commonwealth Edison branch of the N. E. L. A.

MR. PETER JUNKERSFELD, until recently electrical engineer of the Commonwealth Edison Company, has been appointed assistant to the second vice-president, succeeding Mr. H. E. Niesz, resigned. Mr. Junkersfeld is a man of high standing in his profession, and his engineering training will make him a valuable assistant to Vice-President Ferguson. He is a graduate of the electrical engineering department of the University of Illinois, class of 1895. Soon after graduation he entered the service of the Chicago Edison Company, and he has had a varied and fruitful experience with that company and its successor, the Commonwealth Edison Company. He has paid particular attention to alternating-current work, being one of the first engineers to employ a four-wire, three-phase system of primary distribution on a large scale. He is a member of the American Institute of Electrical Engineers and a number of other electrical societies, and has made a number of valuable contributions to the literature of the art by papers read before technical societies.

MR. HOMER E. NIESZ has resigned as assistant to the second vice-president of the Commonwealth Edison Company, Chicago, to become

manager of the Cosmopolitan Electric Company, of the same city. Mr. Niesz, who is widely known and highly esteemed by electrical men, has been connected with the Commonwealth Company and its predecessor, the Chicago Edison Company, for a number of years. He was for a considerable period assistant superintendent of construction, and in 1899 he was appointed assistant to Mr. L. A. Ferguson, then general superintendent and now second vice-president of the company. Mr. Niesz, who is a graduate of Mount Union College and an associate member of the American Institute of Electrical Engineers, a member of the National Electric Light Association, Illuminating Engineering Society and other electrical organizations, has given his time and effort freely to further general electrical interests. He was editor of the monumental Question Box presented at the Denver convention of the N. E. L. A., in 1905, and was the local committeeman in charge of the exhibits of the same association at the Chicago convention of 1908. In addition, Mr. Niesz has been managing director of the very successful Chicago Electrical Show for several years. He took up his new duties on July 15.

## Obituary.

MR. ELWYN G. HOVEY died at his residence in Upper Montclair, N. J., July 8, aged 42 years. Mr. Hovey was graduated from Dartmouth College in 1888, and immediately after entered the employ of the Western Electric Company as an electrical engineer. After serving in various capacities, he specialized on the design and construction of telephone central exchanges, and in 1897 was sent to Japan by the company to supervise the construction of several large telephone plants in that country. After he returned to the United States he was transferred to the New York City office of the company, and remained in its service up to the time of his death.

## Trade Publications.

STORE AND OFFICE LIGHTING.—The Central Electric Company has issued an attractive folder, entitled "Hints for Inexpensive Lighting of Stores, Offices and Public Buildings." Various fixtures are shown equipped with "Opalux" shades and reflectors of various types.

CIRCUIT AND LINE FITTINGS.—The Harvard Electric Company, of Chicago and New York, has just issued bulletin No. 18, relating to brackets, sectional switch boxes, conduit boxes, telephone fuses, wire joints, etc.. In this bulletin there is given a detailed description of the various Harvard specialties, dimensions, etc.

MODERN PUMPS.—Bulletin No. 10 of the C. H. Wheeler Manufacturing Company, Philadelphia, has for subjects the long line of steam, electric and power-driven pumps, both for pressure and vacuum, made by this firm. It is notable that a large proportion of the more modern forms of pumps are driven by electric motors.

ELECTRIC FURNACES.—The American Electric Furnace Company, 45 Wall Street, New York, is distributing catalogs descriptive of Rochling-Rodenhauser and simple induction electric furnaces of the Kjellin and Colby types. These three furnaces are well illustrated and described, while reports of tests upon the output are given in outline.

TESTING POLYPHASE INDUCTION MOTORS.—The Triumph Electric Company, Cincinnati, has issued a chart on cardboard giving concise directions for testing polyphase induction motors. The various heads are primary resistance, no-load test, short-circuit test, motor characteristics, service test, insulating tests, puncture and heat tests.

RECEPTACLES FOR DECORATIVE WORK.—Pass & Seymour, Solvay, N. Y., have issued a bulletin (No. 552) devoted to receptacles for decorative work. Prominently mentioned is the type of receptacle which is shipped already connected upon the wire, and which is supplied in any length or streamers a customer may desire, thereby saving time, labor and material.

THE LUMINARIES.—With the title, "The Luminaries," the Tungstolier Company, Cleveland, Ohio, has issued a booklet consisting solely of four strikingly handsome engravings printed in colors. Each occupies a full page, the motives being, respectively, the stars, the moon, the sun and the tungstolier. The design and colors are notably artistic, which is also true of the illuminated title page.

ACHESON PRODUCTS.—The International Acheson Graphite Company, of Niagara Falls, N. Y., has just issued a new folder descriptive of its various products, which include electrodes, dry battery filler, paint pigment, electrotyping leads, graphite for lead pencils, firearms lubrication, general lubrication and graphited greases. The folder is handsomely printed in two colors, and will be appreciated by many as a catalog in miniature.

MOTORS FOR LIGHT MISCELLANEOUS SERVICE.—The Westinghouse Electric & Manufacturing Company has issued a handsomely printed booklet describing the applications of its line of small motors to office, store and shop services. The numerous illustrations scattered through the pages suggest many time and labor saving uses for these efficient little power devices; among these are the motor-driven adding machine, mailing machine, eraser, graphophone, envelope sealer, vacuum cleaner, buffing and polishing wheel, blower, sign-flasher, box-covering machine, hand drill, hack saw, coffee grinder, etc.—applications selected at random from the large number of uses where the electric motor provides the ideal power.

TUNGSTEN LIFE SAVER.—This is a device composed of a sensitive helical spring arranged between the inner ends of oppositely disposed stirrup-like hangers which permit of lateral or oscillating motion in every direction and absorb shocks and vibrations. The device is used chiefly in connection with tungsten lamps and tungsten lamp fixtures and is built by the American Arc Lamp Company, of Kalamazoo, Mich., and described in its Bulletin No. 40.

STONE & WEBSTER SYMBOL.—Stone & Webster, Boston, have issued a handsome pamphlet relating to its recently adopted symbol—a triskelion enclosed by a triangle. The former is symbolic of energy, life, motion and progress, and the latter of stability. The pamphlet gives illustrations of various forms of the triskelion, which is a three-armed swastika, and the text gives a historical account of the symbol and of the various significances which have been attached to it.

DIRECTLY-CONNECTED ENGINE-DRIVEN GENERATORS.—The General Electric Company, Schenectady, N. Y., has issued Bulletin No. 4664, devoted to directly-connected engine-driven railway generators, which embody a number of improvements over previous types. The standard line of these generators range in rating from 100 kw to 2700 kw, and the speeds have been selected to adapt the generators for direct connection to steam engines. They are designed to run at the prevailing full-load railway voltages.

IN MEMORIAM.—The directors of the Shelby Electric Company have issued "A Tribute" to the memory of Mr. J. C. Fish, long the president of that company. It is tastefully but simply printed on heavy paper and is prefaced with an excellent photograph portrait with signature. The body of the text includes a brief delineation of the man as his nine associates knew him in the close intercourse of daily life, and it is signed by all of them at the end, in autograph. The whole thing is admirable in conception and dignified in execution.

VENTILATING FANS AND BLOWERS.—The American Blower Company, Detroit, Mich., has issued three booklets dealing with different aspects of ventilation by fans and blowers. One of these is the "Sirocco" marine fan, which is electrically driven and has been supplied to many warships in our own, European and Japanese navies. Another relates to the fan ventilation of buildings and special dispositions for hotel kitchens, and for laundries, restaurants, etc. The third is a handbook of information on blowers and exhausters for glass factories. All three are handsome specimens of pamphlet work, and particularly the second mentioned.

INVERTED ARC LAMPS.—The Prime Electric Company, of New York, has issued Catalog P, illustrating and describing its miniature arc lamps. In both the inverted and hanging types there is only one moving part and no clutches. The lamp operates on 110 or 220-volt circuits and consumes 4½ to 5 amp. on 114 volts, with a pressure across the arc of 84 volts. Provision is made to prevent the burning out of carbon holders, and the carbons cannot overlap each other or stick. Standard ½-in. carbons are used. The lamp is made in three sizes, with over-all lengths of 17 in., 19 in. and 22 in. When used for pedestal or newel post lighting the body of the lamp is set on or in the fixture, only the globe being visible.

ELECTRIC POWER FOR DOMESTIC PURPOSES.—The Westinghouse Electric & Manufacturing Company has issued an attractive little folder, entitled "Electric Power for Domestic Purposes," which offers many valuable suggestions for the use of small motors in the home. Among the labor-saving applications of electric power noted are to the sewing machine, vacuum cleaner, washing machine, ice-cream freezer, coffee grinder, meat chopper, ironing machine, silver polisher, dish washer and the motor-driven pump. A novel electric-driven household utility, illustrated in the folder, is the combination of a coffee grinder and meat chopper compactly attached to a small motor.

RAILWAY MOTOR.—The General Electric Company, Schenectady, N. Y., has issued bulletin No. 4668, covering its 216-A railway motor. The motor of the box-frame type, equipped with commutating poles and mica insulated brush holders, and the armature shaft is removable. Among the advantages claimed for this type of construction, in addition to the substantial mechanical features, are practically sparkless commutation on even heavy overloads, reduced wear on commutator, together with a marked reduction in commutator heating, increased life for the brushes and increased efficiency and free running capacity, because of lower core in commutator losses. The motors are rated at 50 hp and designed for operation on 600-volt railway circuits.

INDUCTION MOTORS.—Bulletin No. 351 of the Triumph Electric Company, of Cincinnati, Ohio, is devoted to descriptions and applications of the company's induction motors. These are two and three phase machines designed for frequencies of 25, 40 and 60 cycles, and ranging from 1 hp to 75 hp in size. The motors are wound for 110, 220, 440 and 550 volts, and in sizes smaller than 5 hp are started by a special switch which removes the fuses from the circuit when starting and restores them in the running position automatically. Above 5 hp the motors are started by means of an auto transformer suitably encased and provided with a switch. Several different voltage taps permit the motor to be connected for the starting current best suited to its requirements.

MR. RAY D. LILLIBRIDGE has removed his offices in New York to the eleventh floor of 100 Broadway, and in increasing his facilities as an expert in technical publicity has taken into partnership Mr. William L. Rickard. Ten years ago Mr. Lillibridge developed the idea of rendering advertising and publicity service to non-competitive concerns on a

salary or retainer basis, preparing also technical and trade literature and pamphlets for his clients. The business was successful from the first. Mr. Lillibridge secured the accounts of the American Bridge Company, the Electric Storage Battery Company and the Link-Belt Engineering Company. Subsequently the Stanley Electric Manufacturing Company, the Otis Elevator Company, Dodge & Day and the White Sewing Machine Company's automobile department became clients, and there are many others whose names could be added to the list. Mr. William L. Rickard, although a young man, was for 18 years with the Otis Elevator Company, entering the employ of that concern as a boy. For a number of years he occupied a position as assistant to Vice-President Mills in charge of the sales, and later was manager of the foreign department. His experience and work with the Otis Company have eminently qualified him for a business such as technical advertising.

## Business Notes.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has removed the sales office formerly located at Tucson, Ariz., to 173 San Francisco Street, El Paso, Texas, where it will be continued as a branch of the Los Angeles office.

THE RAYMOND CONCRETE PILE COMPANY, of New York and Chicago, secured, through its Schenectady representative, G. W. Van Vranken, a contract, just executed, for the concrete piling foundations of the pattern storage warehouse of the General Electric Company at Schenectady.

THE WARD LEONARD ELECTRIC COMPANY, Bronxville, N. Y., reports that it is manufacturing the dimmer plates for the New Theater in New York, which will contain the greatest number of circuits and dimmer plates of probably any theater in the world. Two hundred and sixty dimmer plates are being completed at this time.

THE DIEHL MANUFACTURING COMPANY has moved its New York office, of which Mr. C. C. Remsen is manager, from 561 Broadway, around the corner to 90 Prince Street. The reason for moving was the need of increased space to accommodate growing business.

THE HARVARD ELECTRIC COMPANY, 66 West Van Buren Street, Chicago, Ill., announces that after Sept. 1, 1909, its Chicago office and factory will be located at 523 West Van Buren Street, where, with greater quarters and more adequate facilities, it will be better able to take care of its rapidly increasing business. As before, the Eastern office will remain located at 136 Liberty Street, New York City, in charge of John J. Waldman, Eastern manager.

LIBERTY MANUFACTURING COMPANY.—Mr. Glen M. Porter has succeeded Mr. W. M. Owen as manager of the New York office of the Liberty Manufacturing Company, 90 West Street, and will have full charge of the business in the New York territory on and after this date. Mr. Porter is thoroughly acquainted with all the details of the business and will give the large and growing trade in the New York district his entire attention. He will be assisted by Mr. C. S. Roosa, who is already well known to customers of the company.

MORE LIGHT.—For over 50 years the house of I. P. Frink, 551 Pearl Street, New York, has given expert attention to every detail pertaining to the manufacture of reflectors and lighting specialties. No effort has been spared to make its products reach the highest possible mark of efficiency, economy and beauty. Special reflectors for lighting the squash courts of the University Club, Chicago, were installed by this concern a few months ago, and they proved so satisfactory that it has just finished putting in the reflectors for illuminating the tennis courts also. Bronze reflectors for lighting the desks and screens have been placed in the National Bank of Commerce, St. Louis, Mo., and the fixtures for illuminating the Art Gallery of the Alaska-Yukon-Pacific Exposition were made by this firm, which invites contractors, engineers and central-station managers having lighting problems to consult with it.

# Weekly Record of Electrical Patents

### UNITED STATES PATENTS ISSUED JULY 6, 1909.

[Conducted by W. F. Bissing, Patent Law, 2 Rector Street, N. Y. City.]

The following list contains patents that should have appeared in last week's issue, but were not received in time from the Patent Office, owing to the failure of the contractor to supply copies. We are informed by the Patent Office that the patent specifications that should have been issued July 13 will not be received for distribution until the present week.

926,732. ARC LAMP; R. Fleming and C. A. B. Halvorson, Jr., Lynn, Mass. App. filed Nov. 16, 1903. Flaming-arc lamp having a draft tube, and electrode thereon with means for moving electrode in scraping engagement with the walls of slots on the tube.

926,754. SOCKET FOR ELECTRIC LAMPS; W. G. Lindemann, Milwaukee, Wis. App. filed Feb. 20, 1909. Husk chandelier socket in which the cord and lamp may be removed without disengaging the shade, the casing being integrally formed from a single piece of metal.

926,757. PUNCTURE-INDICATING DEVICE FOR TIRES; James L. Marmaud, Worcester, Mass. App. filed Sept. 14, 1908. The pressure within the tire controls an electric circuit so that the puncturing of the tire gives the alarm.

926,792. ELECTRIC ARC LAMP; W. S. Weedon, Schenectady, N. Y. App. filed March 12, 1904. For arc lights using electrodes of titanium carbid which become more or less covered with a film that is non-conducting. Starts the arm from the side of the electrode away from its arcing end and transfers to the end of the electrode.

926,793. ARC LAMP; W. S. Weedon, Schenectady, N. Y. App. filed June 13, 1904. For drawing an arc in the arc light, by means of two electrodes normally in alignment, a stop out of alignment therewith, one of the electrodes being movable into alignment with the stop.

926,818. BLOCK SYSTEM FOR RAILWAYS; G. W. Nistle, E. Inskip and B. W. Brady, North Muskegon and Chicago, Ill. App. filed Nov. 18, 1907. The train is automatically arrested when it reaches a block set at danger, by throwing on the air brakes, from an improved type of track lever.

926,831. TELEPHONE JACK; A. L. Sohm, Whittier, Cal. App. filed Aug. 4, 1908. Avoids removing the entire plate holding the jacks, by providing a bridge strip secured by a locking rod, which latter may be withdrawn to free the parts.

926,857. TERMINAL FOR ELECTRIC CABLES; C. W. Davis, Edgeworth, Pa. App. filed Aug. 3, 1908. For protecting the stripped portion of the cable by means of a thimble secured to the sheath of the cable and a sleeve of insulating material between the thimble and a disk carried by the conductor.

926,874. MOTOR-CONTROLLING DEVICE; L. Janisch, Berlin, Germany. App. filed Oct. 10, 1907. A resistance and switch with means for operating the controlling mechanism and closing the switch in the initial movement thereof, the switch being open at speed.

926,884. AUTOMATIC CARRIER; S. H. Libby, East Orange, N. J. App. filed Aug. 7, 1905. A carrier with a driving motor, a hoisting motor, a current collecting device, a controlling switch and a height limit device.

926,890. ELECTRIC LOCK; T. C. Nixon, Chicago, Ill. App. filed Feb. 19, 1908. Electro-mechanical lock in which the bolt may be retracted by a key or spring and the shooting of the bolt to the locked position is controlled by an electromagnet.

926,900. TRANSMITTING APPARATUS; H. Shoemaker, Jersey City, N. J. App. filed Dec. 10, 1908. For transmitters of wireless telegraphs controlled by a key through which only a small fraction of the entire current passes. Provides an arrangement of differentially arranged inductances, one set being always in circuit while the other is in series with another inductance and is controlled by the key.

926,906. DISTRIBUTING INSULATOR BRACKET; A. L. Stadermann, Terre Haute, Ind. App. filed June 26, 1907. A plurality of independent insulators are strung on a rod carried by a bracket.

926,933. WIRELESS TELEGRAPHY; L. De Forest, New York, N. Y. App. filed March 22, 1905. Spark gap making use of the vapor of a metal, such as mercury, which collects in the bottom of the tube, the tube being provided with an enlarged chamber having a channel containing a liquid electrode with offset pockets.

926,934. WIRELESS TELEGRAPH TUNING DEVICE; L. De Forest, New York, N. Y. App. filed Jan. 20, 1906. A spiral of metallic ribbon and a contact operating transversely across said spiral whereby the capacity and inductance may be varied in a continuous manner.

926,935. WIRELESS TELEGRAPH TRANSMITTER; L. De Forest, New York, N. Y. App. filed Feb. 2, 1906. Spark electrodes are located in a doubled-walled, ventilated muffler and a helix is mounted on the muffler.

926,936. SPACE TELEGRAPHY; L. De Forest, New York, N. Y. App. filed June 20, 1907. A source of practically continuous high-frequency electrical oscillations, a radiating conductor associated therewith, an oscillation circuit associated with said source and controlling it, and a source of vibratory electrical energy associated with the oscillation circuit.

926,937. SPACE TELEPHONY; L. De Forest, New York, N. Y. App. filed June 25, 1907. A plurality of oscillation circuits, transmitting devices therefor, controlling means common to all of the devices and means for converting the energy of the oscillation circuits into radient energy.

926,950. AUTOMATIC RINGING CIRCUIT AND APPARATUS FOR TELEPHONE EXCHANGES; R. H. Manson, Elyria, Ohio. App. filed Feb. 1, 1907. A thermal relay is used for cutting off the ringing circuit and commutators to interrupt the flow of the generator current so as to give intermittent ringing, and a condenser is used in the shunt path for the line current around the relay.

926,951. ELECTRICAL SWITCH; R. H. Manson, Elyria, Ohio. App. filed Feb. 28, 1907. Hook switch for telephone in which the lever may be readily detached.

926,956. ILLUMINATING DEVICE; W. N. McComb, New York, N. Y. App. filed March 25, 1908. An electric display device for producing the kaleidoscope effect by mounting lamps in compartments and arbitrarily selecting the lamps to be flashed in an irregular manner.

926,962. TERMINAL OUT-CUT; F. D. Reynolds and J. Sachs, Hartford, Conn. App. filed Jan. 7, 1908. A fusible conductor for safety fuses whose sectional outline is serrated and large in relation to its sectional area.

926,964. COIL; C. Schrader, Halensee, near Berlin, Germany. App. filed Aug. 4, 1908. A coil consisting of a plurality of superposed broad strips of metal, having holes through the commencing end of the coil, passes to the outside.

926,994. TELEPHONE CONNECTING APPARATUS; E. C. Molina, Arlington, Mass. App. filed June 19, 1907. For electro-mechanically making connections at central station, in which switching mechanism provided with a plurality of groups of fixed line contacts is employed and an independent movable contact member co-operating therewith. Telephone lines for one class of service are connected to one group of contacts and for another class are connected to a different group.

927,010. ELECTRIC ARC LAMP; T. Spencer, Philadelphia, Pa. App. filed April 3, 1907. The arc is formed between the two lower ends of carbons which point downwardly. Particularly useful with flaming arcs. Details.

927,014. CONTROLLING DEVICE FOR VEHICLES; R. Werkner, Budapest, Austria-Hungary. App. filed Jan. 14, 1908. Combines a vehicle with a heat engine, an electric generator coupled therewith, a

storage battery, shunt-wound motors connected to the wheels and gearing for connecting the heat engine and the wheels.

927,018. ELECTRIC SIGN; Francis D. Ammen, New York, N. Y. App. filed Feb. 8, 1908. Electric signs in which the units are lighted and extinguished, beginning at opposite points and rapidly approaching a meeting point, producing the effect of a collision of lights followed by a sudden display like an explosion.

927,021. PROCESS OF TREATING ARSENICAL ORES AND SPEISS; Anson Gardner Betts, Troy, N. Y. App. filed Feb. 23, 1909. An electrolytic process for treating arsenical ores.

927,025. CALL DISTRIBUTING TELEPHONE EXCHANGE SYSTEM; S. H. Browne, Pittsburgh, Pa. App. filed Feb. 11, 1905. An automatic switch having a moving testing wiper, a testing relay connected thereto, an armature contact for the relay and a local circuit controlled by the contact which continues the energization of the testing relay independently of the wiper.

927,027. ELECTRIC WATER HEATER; H. W. Denhard, San Francisco, Cal. App. filed June 25, 1908. A reservoir with an electrically heated extension and a feed tube carrying a deflector for the hot water.

927,032. CABLE HANGER; J. E. Feiock, Martin's Ferry, Ohio. App. filed July 7, 1908. An S-shaped strip whose ends lock together, the loops embracing the supporting wire and the cable.

927,041. RAILWAY SAFETY DEVICE; S. H. Harrington, New York, N. Y. App. filed March 29, 1904. A printing device is carried by an arm on the semaphore pole which makes it mark on the passing car if the car should go by when the semaphore is at danger.

927,045. COMBINED INSULATOR AND LIGHTNING ARRESTER; W. F. Hiatt, Danville, Ind. App. filed Aug. 24, 1908. A cylinder with a core of insulating material in sections, adapted to hold a wire.

927,111. ELECTRIC PROTECTION SYSTEM; C. U. Carpenter, New York, N. Y. App. filed Nov. 23, 1908. Electric protection of apartment houses having a main electric protective circuit, an alarm mechanism and a series of key-operated switches, each of which is adapted, when operated, to remove the alarm from the control of a corresponding protected structure.

927,142. ROTARY CONVERTER FOR DIRECT CURRENTS; L. A. Hawkins, Schenectady, N. Y. App. filed March 28, 1908. Substitutes for the two machines of the motor generator, one machine having a commutator and two sets of brushes displaced 90 deg.

927,146. METER LOCK; J. H. Jackson, New York, N. Y. App. filed Nov. 14, 1908. Locks for meters with removable casings to prevent tampering with the meter. Makes use of a seal.

927,173. ELECTRIC HEATER; K. Schluter, Kiel-Gaarden, Germany. App. filed May 20, 1908. An electric heater having its resistance members constructed of nickel tubes.

927,178. MOTOR-CONTROL SYSTEM; J. A. Seede, Schenectady, N. Y. App. filed May 28, 1908. For driving rolling mills in which direct current supplies the motor of a flywheel motor generator set, a second motor is also supplied with current and means operating on the field of the motor generator limits the amount of power.

927,185. TUBULAR INSULATOR; L. Steinberger, New York, N. Y. App. filed June 4, 1906. A high-tension insulating tube comprising a plurality of cylindrical members, concentrically arranged, connected by spacing partitions, one partition being staggered relatively to another.

927,186. HIGH-POTENTIAL STRAIN INSULATOR; L. Steinberger, New York, N. Y. App. filed July 20, 1906. A disk having holes of tapering diameter, insulating sleeves therein, tapering bolts fitting the sleeves with mechanism connected with the bolts for producing a mechanical strain.

927,191. ELECTRICAL MEASURING INSTRUMENT; E. Thomson, Swampscott, Mass. App. filed Nov. 13, 1907. An instrument with a long scale and uniform divisions, abnormally sensitive at certain points. Makes use of a uniform magnetic field and a coil shaped like an isosceles triangle and mounted for bodily edgewise movement.

927,209. ARMATURE FOR ELECTRIC MACHINES; W. J. Bauroth, Columbus, Ohio. App. filed Aug. 23, 1906. Improvement in armatures whose cores are made up of sheet-metal laminæ. Details.

927,218. JUNCTION BOX FOR ELECTRICAL CONDUCTORS; J. F. Burns, Philadelphia, Pa. App. filed Sept. 30, 1908. A junction box having a socket for a conduit with an oblique wall, an insulating bushing and a removable cover.

927,219. JUNCTION BOX FOR ELECTRICAL CONDUCTORS; J. F. Burns, Philadelphia, Pa. App. filed Sept. 30, 1908. A box having sockets for conduits with axes at right angles and removable covers for openings in the box.

927,230. DICTOGRAPH; W. F. H. Germer, New York, N. Y. App. filed July 31, 1908. The manager of the office dictates his letter to any one of his corps of stenographers, without requiring them to leave their desk, by means of a telephone system, a three-wire circuit extending from the manager's station to the stenographers, and a key normally opening one wire in each of the three wires and adapted to open another wire of each three-wire circuit to a non-communicating manager's station when talking circuits are established to any particular station.

927,260.—TRAINING AND FIRING MECHANISM FOR GUNS; J. F. Meigs and S. A. S. Hammar, South Bethlehem, Pa. App. filed Feb. 4, 1907. A sighting device, adjusting means for the gun and electrical means for automatically firing the gun when the adjustment is obtained.

927,274. DYNAMO-ELECTRIC MACHINE; L. A. Pape, Norwood, Ohio. App. filed Aug. 19, 1907. For automatically tightening the current-carrying coils of the rotating member by means of an automatic follow-up wedge acting by centrifugal force.

927,314. CURRENT INDICATOR FOR DETECTOR; C. D. Babcock, New York, N. Y. App. filed Aug. 15, 1908. For wireless telegraphy in which a sensitive conducting element is used containing a chemical salt whose conductivity changes at a critical temperature with great rapidity.

927,318. DYNAMO-ELECTRIC MACHINE; B. A. Behrend, Norwood, Ohio. App. filed May 17, 1908. Alternating-current generators with rotary field of the flywheel type, having a wide spider rim, so that a large volume of air can be caused to circulate through passageways in the stationary core.

927,321. INSULATOR; J. T. Bond, Palatka, Fla. App. filed March 12, 1908. A body portion, an integral base, the body being cylindrical and the base rectangular.

927,344. ADJUSTABLE CASING FOR LAMP SOCKETS; E. H. Freeman, Trenton, N. J. App. filed July 13, 1908. Details in the casing or shell.

927,347. TELEGRAPHIC INSTRUMENT; J. J. Ghegan, Newark, N. J. App. filed Aug. 25, 1908. Improved telegraph transmitting key with a switch lever insulated therefrom which may connect with the contact or with the key, as desired.

927,373. SPRING HINGE FOR ELECTRICAL AND OTHER DEVICES; L. H. Moulthrop, Bridgeport, Conn. App. filed July 31, 1908. For doors of electrical plug receptacles in which the hinge pin consists of a spiral spring.

927,374. PROCESS OF MANUFACTURING INCANDESCENT MANTLES; A. Muller, Furstenwalde-on-the-Spree, Germany. App. filed Oct. 4, 1907. Impregnates the fabric with a colloidal solution of an oxidhydrate of a rare earth.

927,375. ELECTRIC ISOLATION SYSTEM; N. C. McClure, Healdsburg, Cal. App. filed Oct. 18, 1907. For ringing one subscriber on the line and talking, without ringing others. Uses a central-office indicator meter, provided with a coil, springs, a permanent magnet with poles, and a graduated plate indicating the amount of deflection. Each subscriber's instrument is similarly equipped.

927,377. SIGNALING SYSTEM; J. G. Nolen, Chicago, Ill. App. filed Oct. 4, 1905. Combined fire alarm and watchman's signaling system having a line leading from a central to a series of stations and code teeth at each station.

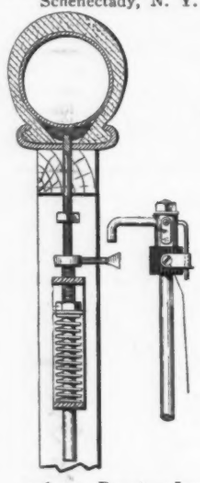
927,382. CONNECTION BLOCK FOR ELECTRIC SERVICE CIRCUITS; J. G. Swallow and W. E. McCoy, New York, N. Y. App. filed Oct. 12, 1907. For testing meters in service by means of a special connection block having binding posts for service wires, and also for wires to the meter.

927,395. TELEPHONE TRANSMITTER; C. Adams-Randall, New York, N. Y. App. filed April 16, 1907. Obtains increased voltage through the transmitter by supporting on the diaphragm a confined variable resistance conductor of uniform depth and large conducting capacity, under pressure.

927,397. SINGLE-PHASE MOTOR CONTROL; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Jan. 4, 1908. Control system for repulsion motors with short-circuited armatures for starting and for changing from one running connection to another with an electrically interlocked set of switches whereby the above connections are produced automatically in sequence.

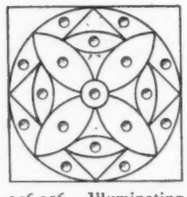
927,398. ALTERNATING-CURRENT MOTOR; E. F. W. Alexanderson, Schenectady, N. Y. App. filed April 17, 1908. Repulsion motor of the commutator type in which the armature is connected in a local closed circuit and short circuited along the line of magnetization of the inducing winding through a central portion of the inducing winding included in the circuit.

927,399. ALTERNATING-CURRENT MOTOR CONTROL; E. F. W. Alexanderson, Schenectady, N. Y. App. filed June 1, 1908. For controlling single-phase motors of the commutator type, particularly repulsion motors in which the armature is short circuited at starting, then opened, and on the return movement of the controller only re-established after the starting or off position of the controller is reached.



926,757. Puncture Indicating Device for Tires.

926,933. Wireless Telegraphy.



926,956. Illuminating Device.

927,404. BLOCK SIGNAL SYSTEM; A. G. Davis, Schenectady, N. Y. App. filed March 28, 1906. Signal system for electric roads having parallel tracks and a connection from the block to the parallel track adapted to form a path for the power current, two windings inserted respectively between the rails of the block and the connection, a signal for the block and means operative on failure of current in either winding to indicate danger.

927,413. INDUCTION COIL; A. K. Keller, La Fayette, Ind. App. filed Aug. 2, 1908. Telephone switch stand with induction coil which is detachable and comprises a core and windings thereon and a terminal head projecting above the core.

927,414. TELEPHONE SYSTEM; J. M. Latimer, Flushing, N. Y. App. filed Sept. 14, 1908. For transmitting subscribers' messages and other messages so that the two classes can be transmitted simultaneously without interfering with one another. One set of messages consists of local alarms.

927,417. HOIST; S. H. Libby, East Orange, N. J. App. filed May 8, 1907. Motor-driven hoist in which the improvement lies along mechanical lines.

927,428. THIRD-RAIL CONDUIT SYSTEM; P. M. Reynolds, San Francisco, Cal. App. filed Nov. 30, 1908. A housing for the electric conductor having a plurality of sections, the conductor embedded therein and providing a continuous electrical connection.

927,433. TRANSMITTING APPARATUS; Harry Shoemaker, Jersey City, N. J. App. filed July 22, 1908. A transmitter of electro-radiant energy having a plurality of pairs of differentially related inductances associated with the source of energy and a key for cutting in and out an inductance of each pair.

927,455. ELECTRICAL SELECTOR; E. A. Faller, New York, N. Y. App. filed April 8, 1904. Combination with a series of line terminals divided into groups, a series of corresponding normally open local circuits, means controlled by the groups to partially close one circuit and means controlled by one element of the group for completing the local circuit.

927,465. CONTROL APPARATUS; G. H. Hill, Schenectady, N. Y. App. filed April 18, 1908. Means for controlling electric motors from any of a plurality of stations by pressing a button. Details.